AUGUST 27, 1938

ELECTRICAL WORLD

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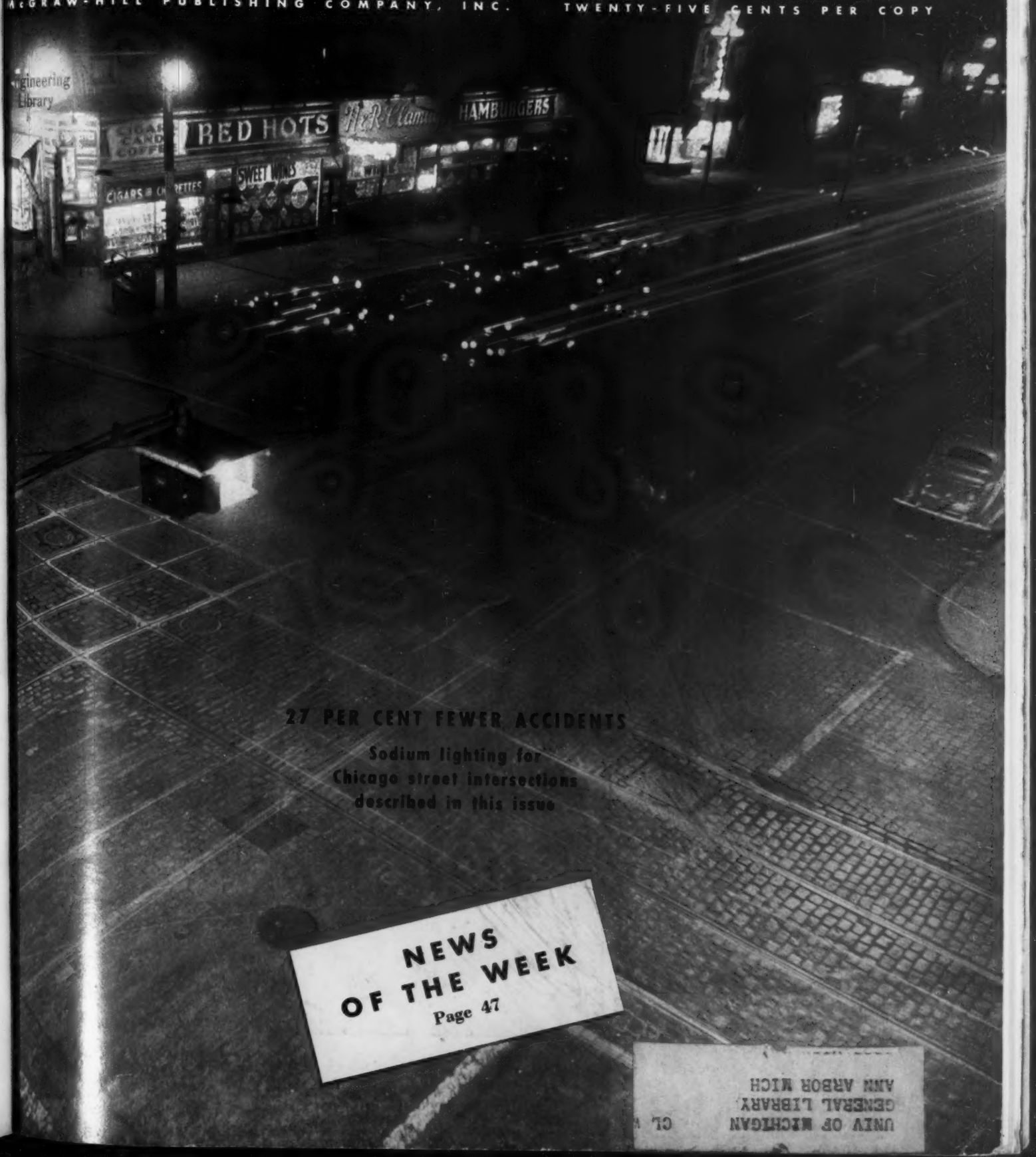

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Sodium lighting for Chicago street intersections described in this issue

NEWS OF THE WEEK
Page 47

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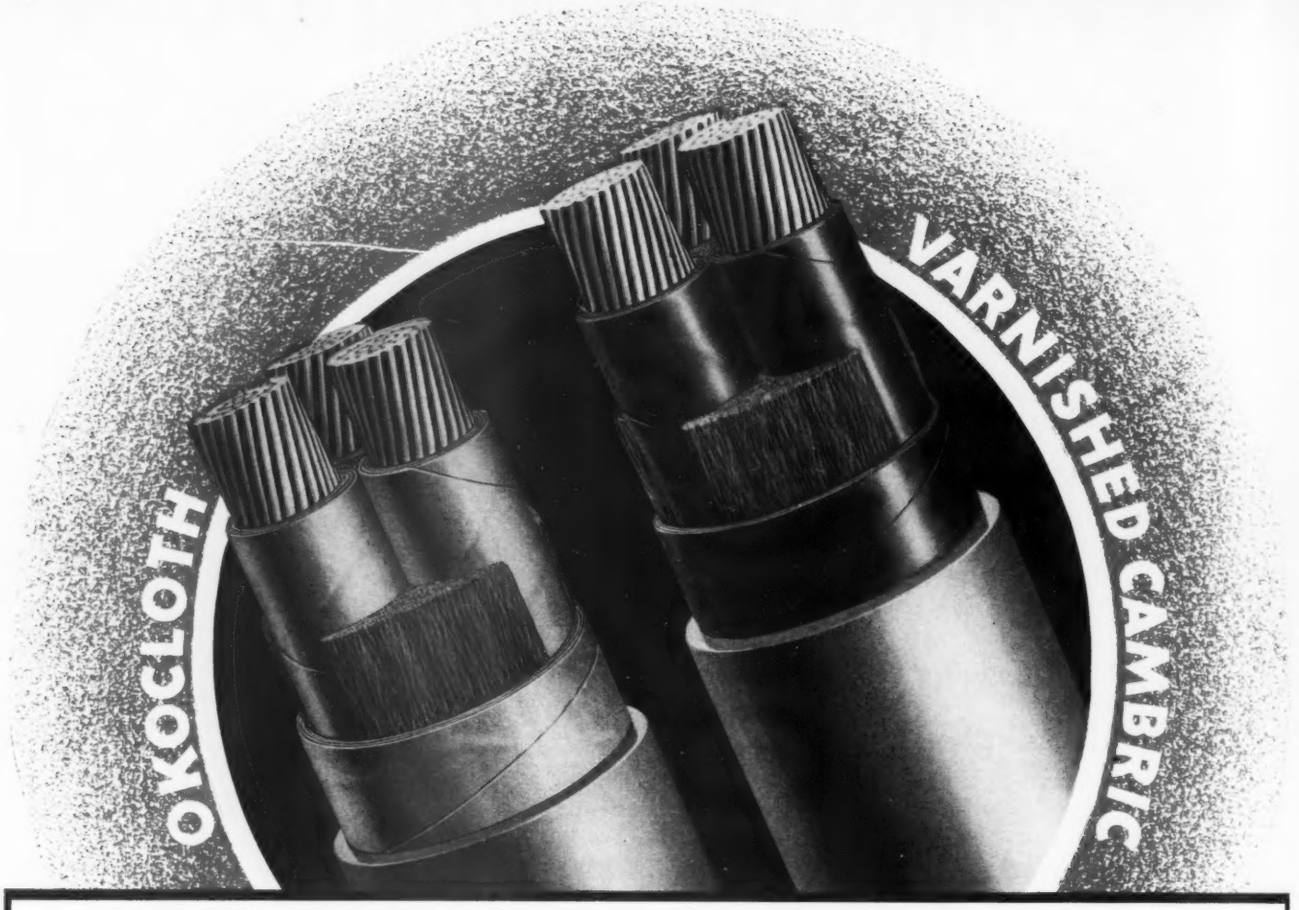

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ELECTRICAL WORLD

AUGUST 27, 1938

Happy Employees

The editorial in the July 30 ELECTRICAL WORLD, *"Stop Cussing, Start Discussing," to me is the best-expressed idea of the way for public utilities to obtain good public relations. It seems to me that the fourth paragraph of that article is the only way for any company dealing with the public to thrive. And I often wonder how many public utilities employees are happy at their work.*

I believe it would be worth while to reprint the fourth paragraph of that article in large print and try to impress upon the public utilities that the best and easiest way to get the public on their side is through happiness and contentment of their employees. That article has meant a great deal to me.

This letter, written out in long hand by a utility employee, should cause every utility executive to ask himself if he knows how contented, how happy in their work, his people really are.

The electric utility industry has prided itself on its employee relations. Employment in this field, as compared with other businesses, is exceptionally stable, employee turnover exceptionally small. The men and women of the industry have been proud of their work and have built up a sort of superiority complex as regards their occupation. Does this not mean happy and contented employees?

Happiness in one's work springs from many causes. There is the work itself, the compensation, opportunity for advancement, job security, retirement pensions, attitude of management as reflected by the boss.

The work is pleasant, clean and, except for the unusual emergencies when everybody gives of their utmost, is not slave driving in nature. This, plus the stability of employment, old age security, and certain other advantages, such as sickness relief, caused people to seek jobs with the utilities; notwithstanding the fact that with job security must necessarily go slowness of advancement, seniority and fair, but not the large, compensation of competitive employment.

Paradise hasn't been lost, but in this garden of Eden something has happened. Public utility employees are not altogether as happy today as they were before the depression. Why? Can it be that the New Deal hammering against holding companies has built up a resentment against the influence of centralized financial and management operations? Can it be that the employees are beginning to doubt the stability of employment under private ownership? Or that they see more stability in non-management jobs under public ownership? Can it be that they are worried about their pay, or expected pay increases, in view of increasing taxes, costs and lower rates? Can it be that they are too far away from the management to know what management is thinking or for management to know what they are thinking? Can it be that no company policy affecting employee relations, and mutually acceptable to both, exists, or, if there is such a policy, can it be that it is so old as to have been forgotten, or that it has gradually grown into disuse?

It is important that the employees of the industry be happy in their work. Good public relations cannot be achieved until employee relations are good. When a utility has an employee relations policy that is understood from top to bottom and is mutually acceptable to both employees and management, when the employees know the facts about a company, its policies and the reasons therefor, its program, then and then only will there have been laid the foundation upon which a sound public relations program can be built and promoted.

So important is public relations and so essential to such relations is good employee relations that ELECTRICAL WORLD in its October 8 issue will present a program for employee and public understanding and some graphical presentations of data to promote better understanding.

The best results appear to come from organized public contact through employees. Men and women who are happy in their work, and understand what the company is doing and how it is serving its territory, can be counted upon as an asset in turning the tide in the company's favor and creating better public understanding.

Plant Design Modified by New Developments

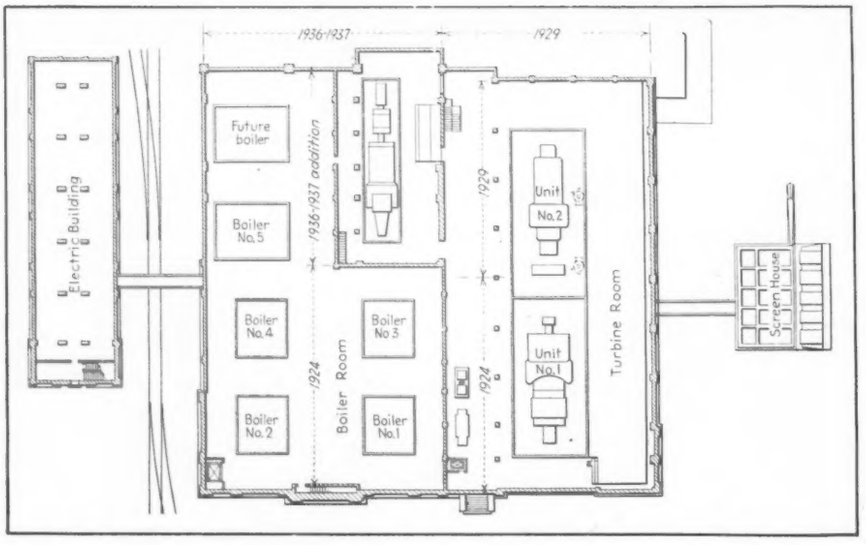
By G. T. SHOEMAKER

Vice-president United Light & Power Engineering & Construction Company, Kansas City, Mo.

PROGRESS of recent years in the development of equipment for more satisfactory burning of the Midwestern coals most economically available to the Riverside station of the United Power Manufacturing Company is largely responsible for the altered and more compact design of the plant that was accomplished in the capacity addition now completed and in operation.

Riverside station is situated on the west bank of the Mississippi River a few miles north of Davenport, Iowa. It supplies energy to Davenport, to Rock Island, Moline and East Moline, across the river in Illinois, and to areas adjacent to these cities. As originally built in 1924, the plant contained four boilers, each rated at 90,000 lb. of steam per hour at 400 lb. pressure and 700 deg. F. The boiler room was planned for two rows of these boilers facing on a center firing aisle and with a long narrow turbine room for end-to-end units parallel to the boiler rows.

Riverside station today



A more compact plant

One unit of 20,000 kw., 0.8 p.f. was installed in 1924 and a second of 20,000 kw., 0.7 p.f. was added in 1929. It was contemplated that future extensions of the station would follow this general layout. The main limiting factor on the size of the original boilers, fairly small in comparison with units in other contemporary major stations, was the difficulty of obtaining burning equipment wholly suitable for the coal to be used in the plant. But now, with the availability of much improved coal-burning equipments and methods, it is entirely practical to install boilers of large steaming capacity at Riverside, and this is what was done when the plant was extended last year.

Minimum building addition

As appears in the accompanying floor plan and exterior view, the new turbine and boiler were added with a minimum amount of new building provision. The new capacity occupies ground area that would have been taken up by four boilers of the original design, space is available for another large boiler and no longitudinal extension of the turbine room was necessary. And a future unit may be installed without any building enlargement at all by replacing two of the existing boilers with larger ones and using the space now occupied by the other two for the future turbo-generator. Not only did the change in layout result in a much

more compact and more conveniently operable plant, it also avoided some rather expensive river and tunnel work for the required increase in condensing water supply.

The plant is built on a solid rock ledge in which costly tunnel extensions would have had to be made if the original turbine room layout had been adhered to. Two 55,000-gal., 42-in., screw type pumps were installed in place of the existing circulating pumps for No. 2 turbine condenser. The new pumps supply water for both No. 2 and No. 3 condensers, each pump capable by itself of handling the double job.

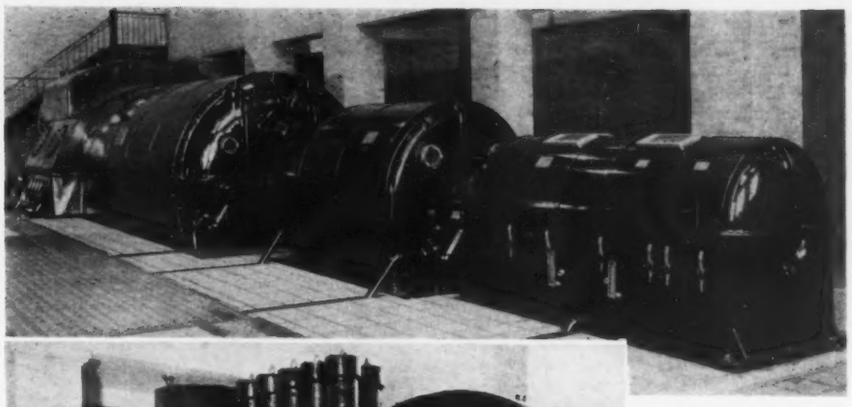
Five machines on one shaft

The new turbo-generator has a number of interesting features. In tandem on the turbine shaft are five generators, comprising main and house service generators and three exciters. The turbine is a double-pressure machine designed to carry full load on either 800 lb. or 400 lb. steam, so that it can operate on the old boilers when the new one is out of service for maintenance work. The turbine may be used as a topping unit in connection with turbines No. 1 and No. 2 for, in addition to three bleed points for feedwater heating, it has a fourth extraction point from which may be taken 100,000 lb. per hour of 400-lb. steam. This connection supplements the reducing valves between the 400-lb. and 800-lb. headers in the boiler room.

The period during which the new equipment has now been in operation furnishes convincing evidence of the progress that has been made in turbine and boiler design in the past decade. In comparison with the older units, the new turbine shows an improvement of 11.5 per cent in water rate when operating with 400-lb., 700-deg. F. steam. With 800-lb. steam at 825-deg. F. total temperature the water rate of the new unit is improved 20.8 per cent over the old turbines. However, in this case the improvement is partially derived from the greater amount of available heat (9.2 per cent increase) supplied to the new turbine by reason of the higher pressure and temperature.

The new boiler is equipped with an economizer and a large Ljungstrom air heater set in series. This arrangement gives about 1.5 per cent better efficiency than the parallel connection of economizer and small air heater on each of the old 400-lb. boilers.

These and other detail points of bettered operation add up to a satisfying total of improvement accomplished at Riverside.

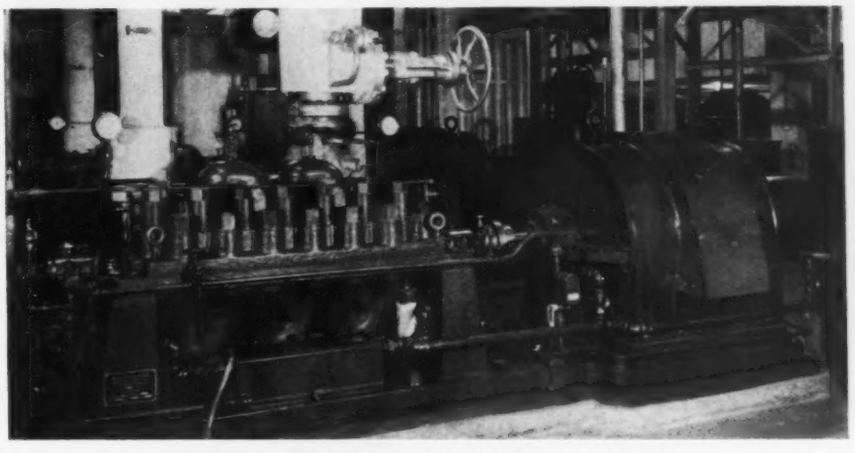


Generator end of the new unit

In the foreground is the housing in which are the three exciters. Next is the house service generator, which shares an inclosed ventilating system with the exciters. At the near end of the main generator is the turning gear drive. Over-all length of turbine and tandem generators and exciters is 64 ft.

Turbine end of the new unit

At the extreme left, mounted on the floor, is the fulcrum shifting device used to set the valves for operation at 400 lb. or 800 lb. steam pressure.



Feed pumps powered with 3,600-r.p.m. motors

Here are the boiler feed pumps, the second visible in the background. Each pump, driven by a 700-hp. motor, pushes 700 g.p.m. of water against an equivalent gravity head of 2,520 ft.

General plant details

Addition to building plan area, 90 ft. wide, 80 ft. long, half for boilers, half for turbine room.

Temporary end wall composed of angle iron grids covered with corrugated transite sealed inside with 1-in. insulation board. Manually operated steel sash.

Roof deck of channel type precast lightweight cement slabs covered with 1-in. cork. Five-ply pitch and gravel roof.

Concrete floors with dark red quarry tile finish in turbine room. Smooth-finish light buff glazed tile walls in turbine room basement. Boiler room floor concrete with steel gratings for runways, balconies, etc.

Whiting 75 ton overhead bridge crane in turbine room.

Turbine room lighted with 750 watt hi-bay units furnishing uniform floor intensity of 10 ft.-candles.

Steam and water details

Turbine, 25,000 kw., 3,600 r.p.m. Full load operation on either 400-lb. or 800-lb.

steam. Bled at three points for feedwater heating. Fourth point for 400 lb. extraction, 100,000 lb. per hour, for operation of lower pressure units if desired.

Welded steel shell, 17,300-sq.ft. single-pass condenser welded to turbine exhaust opening. Condenser will maintain 1.45 in. of back pressure with 70 deg. F. circulating water at turbine full load.

Two 5,500-gal., 42-in. screw type vertical circulating pumps driven by 400-hp., 597-r.p.m., variable-speed, wound-rotor motors.

Two 700-gal., 2 500-ft. head boiler feed pumps driven by 700-hp., 3,600-r.p.m., variable-speed, wound-rotor motors.

Feedwater heated in two closed heaters vented to condenser hotwell for gas withdrawal. Make-up water treated with soda ash before going to evaporators.

Boiler details

One bent tube boiler with steel-casing, water-cooled, continuous drip type furnace complete with superheater, economizer and air heater. Continuous capacity of 225,000 lb. of steam per hour and maximum of 300,000 lb. at 860 lb. pressure, 825 deg. F. total temperature. The coal is weighed to the pulverizers by means of weigh lorries so that an accurate check is obtained of the fuel supplied.

Fuel-burning equipment consists of three 15,000 lb. capacity bowl mills driven by 150-hp., 1,200-r.p.m. motors, complete with feeders and exhauster fans. Twelve tangential powdered coal burners, three in each corner of the furnace. These are so arranged that only one of the three pulverizers can be used independently of the others, fuel being divided into four parts and fired in each corner of the furnace. This arrangement permits a wide range of capacity in the boiler.

Superheat is controlled by a bypass damper which maintains 825 deg. F. from 100,000 lb. to maximum capacity. Steam output from the boiler is controlled automatically by combustion control equipment actuated from steam pressure. The fans are also automatically controlled by this device.

Ash is removed from the furnace by drip type slagging furnace-bottom to a water pit and from there is disposed of by means of a sluicing system.

High-pressure piping for the units consists of carbon molybdenum steel tubing. The valve bodies are also of this material. Flanged joints with small tongue-and-groove facing are used throughout the installation for both steam and boiler feed service. Pressure-reducing valves are provided to reduce steam pressure from 800 lb. to 400 lb. so that steam may be supplied from the high-pressure boiler to the old 400-lb. plant when moderate amounts of steam are required in the old plant above that supplied by the boilers which are on the line. Steam connections are also provided so that the 400-lb. boilers will act as standby capacity for the 800-lb. boiler.

Electrical details

Main generator—20,000 kw., 70 per cent p.f., 13,800 volts Y, three phase, 60 cycle.

House service generator—2,500 kw., 80 per cent p.f., 480 volts delta, three phase, 60 cycle.

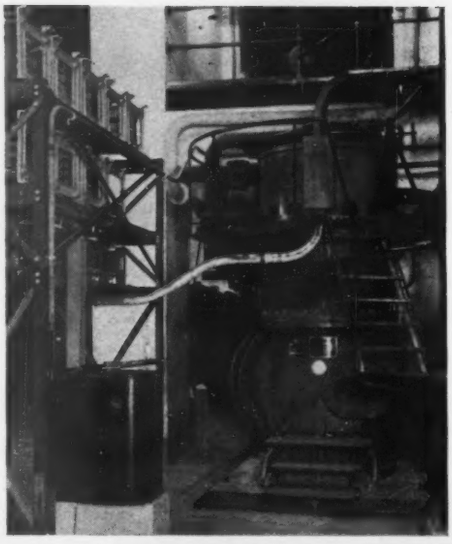
Main generator exciter—100 kw., six pole, 250 volts d.c., separately excited.

House service generator exciter—25 kw., four pole 250 volts d.c.

Pilot exciter—4 kw., four pole, 250 volts d.c., compound wound.

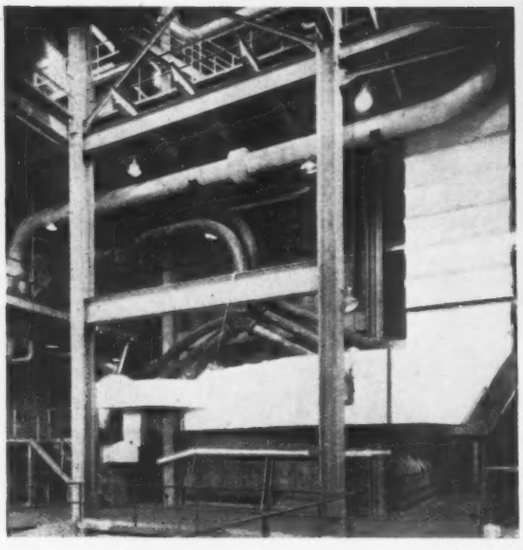
The armature windings for both the main and house service generators were furnished with 2/3 pitch so that the telephone interference factor (T.I.F.) at no load open

[*Continued on page 93*]



Bigger pumps save expense for new water tunnels

This is one of the two 55,000-g.p.m. circulating water pumps, big enough to serve condensers on the new unit and on one of the old ones, thus obviating water tunnel extension work. The 400-hp. motor drive is equipped with automatic restart in cases of voltage failure. Motor control and restart equipment shown at the left.

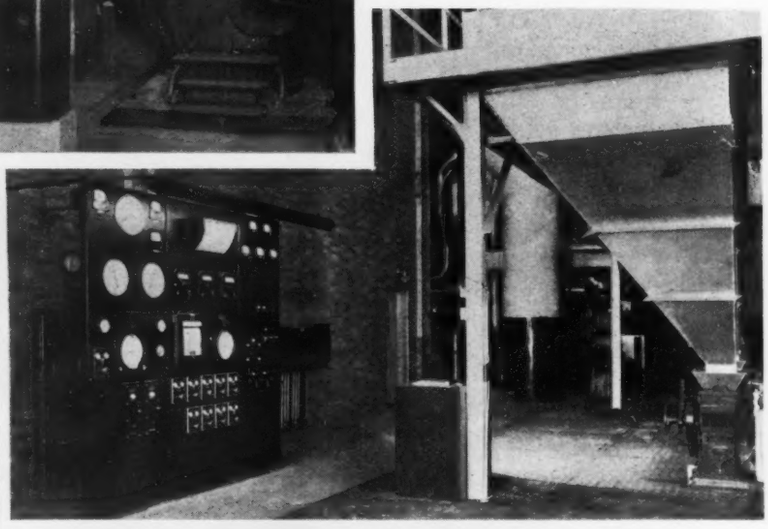


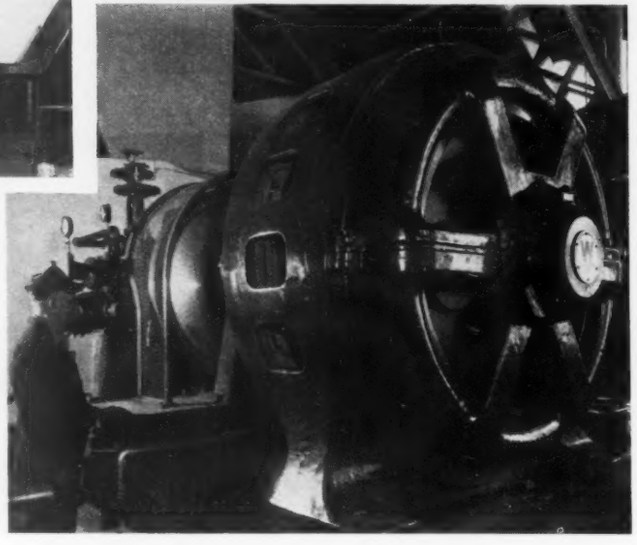
In boiler room

Side elevation of new boiler taken from pulverizer floor. Pulverizers at left of picture, with main 800-lb. steam header directly above.

Firing aisle of new boiler

Boiler control panel consists of three sections, the one at left being a master panel for the present and a future boiler. Center section contains instruments and automatic combustion control devices for the new boiler. Narrower right-hand panel contains all motor controls and instruments for drive motors on boiler auxiliaries. Small panel to right of main panel contains automatic control for coal-feeder motor. Feeders at right under coal spouts.





Induced draft fan drive

This 400/900-hp., 505/707-r.p.m. squirrel-cage motor drives induced draft fan through 42-in. hydraulic coupling, which attendant is looking at.

Full Value From Invested Dollar = Good Service

By E. A. WISCO

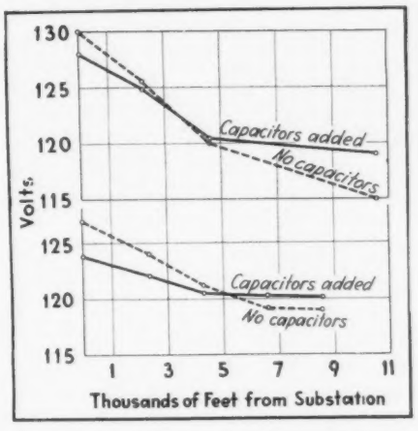
Operating Engineer Interstate Power Company, Dubuque, Iowa

IN THE case of the Interstate Power Company the result from load building in additional burden on power plants, transmission lines and distribution systems is apparent from the fact that energy delivered to the system rose from 128,431,000 kw.-hr. in 1933 to 184,787,000 in 1937, an increase of 56,356,000, or 43.9 per cent. This additional load was imposed on power plants and purchasing points to which only negligible capacity additions had been made. During the period three small generating units were added, but their effect was offset by the loss of a hydro plant and the expiration of a number of purchase contracts.

Necessity for maintaining at least full rated voltage at the customer's service and the desirability of holding it even a little higher for the benefit of both customer and company cannot be over-emphasized. This appears clearly in the figures of lamp performance:

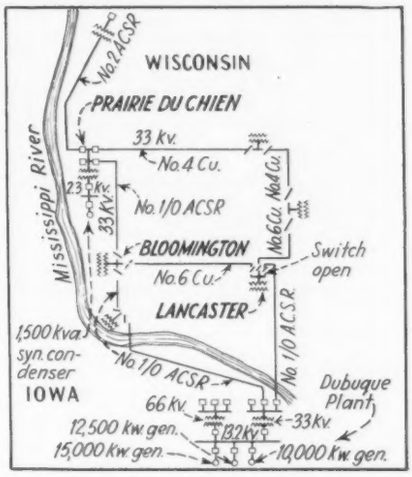
Per Cent Voltage	Per Cent Light Output	Per Cent Energy Used
90	67	84
95	83	92
100	100	100
105	119	108

Many excellent studies along this line have been made and published by lamp manufacturers and utility operators should give them careful consideration. As regards heating applications, such as ranges, the necessity for good regulation is also urgent, since the heat output is proportional to the square of the applied voltage. Thus, if good service is to be maintained only a very narrow range of regulation can be tolerated, from a minimum of normal rated voltage to a maximum of, say, 6 per cent above normal. Outside these limits lie poor service, customer dissatisfaction and complaints. It is important to keep in mind—and also to tell the public—that voltage up to about 6 per cent above normal actually delivers cheaper light and heat, which are what the customer buys, taking into account the cost of replacement of lamps and heating equipment.



Capacitors improve feeder regulation

For the feeder of the upper graph the average power factor was 68 per cent without the capacitor and 85 per cent with it. The average load on this feeder was 600 kw. The lower graph shows regulations of a feeder with 395 kw. average two-hour load and power factor averages of 78 and 100 per cent respectively without and with capacitor.



Synchronous condenser greatly increases transmission loop capacity

Operating this loop with constant voltage at power plant limited transmission capacity to 2,068 kw. By varying plant voltage with load and using 1,500-kva. synchronous condenser carrying capacity was raised to 3,842 kw.

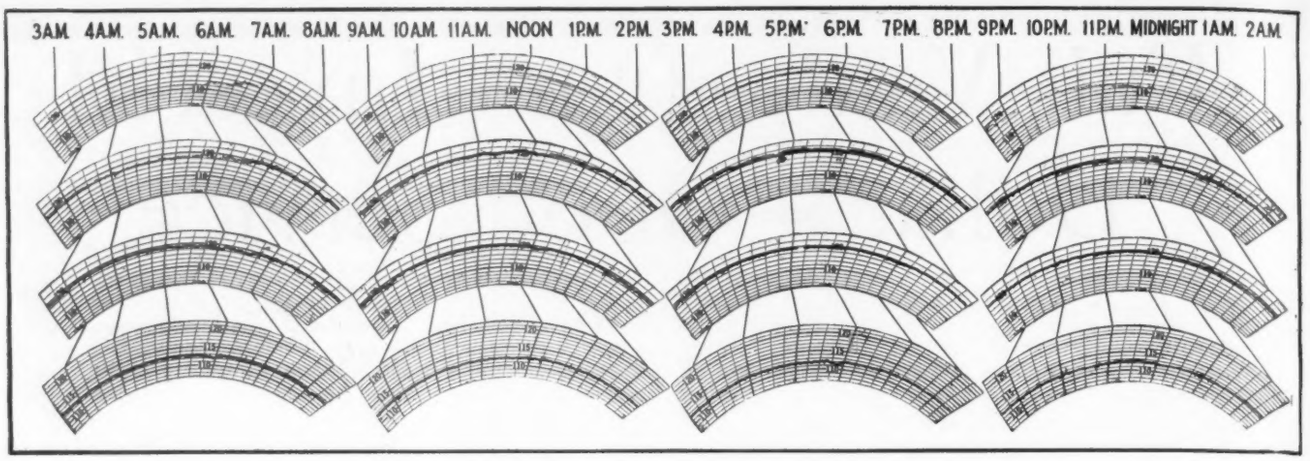
The reason for stressing the need for good voltage regulation in connection with load building is the fact that added load results in voltage drop, so that one of the first results of added load, if system facilities do not keep pace, is voltage too low to give adequate service. In fact, the load added might even cause sufficient voltage drop on the present transformers and secondaries to *reduce the revenue derived from the load already being served by an amount equal to the expected revenue from the load being added.*

So far as the power plants are concerned their capacity is usually limited by the prime movers and boilers, so when reserve capacity is used up there is little to do but to make the investment necessary to supply additional turbines and steam-generating equipment or to build additional power plants, as the case may be.

Carrying the increasing load

However, various means are often available for increasing the load which may be carried over existing transmission lines, substations and distribution systems with comparatively little investment. A number of years ago, for instance, it was common practice to operate at a constant bus voltage throughout the 24 hours. During times of light load even the most remote circuits would have about the same voltage as the power plant. During period of heavy load, however, the voltage drop on the system would reduce the delivered voltage.

If, for instance, voltage 6 per cent lower than that carried at the power plant represented the lower limit of voltage for delivering good service, then the carrying capacity of the system would be limited to the amount of load which would produce



Voltage variation at the power plant, not at load points

These curves, extended from circular charts, show how line voltage drops, varying with load, may be compensated at the supply end instead of being allowed to cause ups and downs of pressure at load centers. Referring to the map, the top curve shows voltage at the plant in Dubuque, next down is voltage at Lancaster, next below is Bloomington and at bottom is voltage at Prairie du Chien.

6 per cent voltage drop and, obviously, if the plant voltage were raised 6 per cent during heavy load periods the permissible loading capacity of the transmission and distribution system would be doubled without any increase in investment. Compensating for voltage drop on the system by varying the voltage on the power plant bus represents about the only expedient for increasing the load-carrying ability of the system without increasing investment in system facilities.

At the time an electric range, for example, is installed it is necessary immediately to make whatever investment is required to supply adequate distribution transformer capacity and secondary capacity to serve this additional load. At the same time that the distribution transformer and distribution secondary facilities are changed to take care of one range installation they are put in shape to take care of whatever additional ranges are likely to be added in that vicinity. Our average cost for the year 1936 to increase distribution facilities and to connect 656 ranges was $70 per range.

Ordinarily, we found it more economical to install additional distribution transformers to serve range loads than to increase secondary copper size above No. 4. In practically no case was it found economical to use secondary copper larger than No. 2, and only rarely would wire as large as No. 0 be justified.

Voltage regulation necessary

As ranges and other appliances are added primary distribution circuits, substations and transmission circuits are loaded nearer to their ultimate capacity, and the problem arises of delivering satisfactory primary voltage to distribution transformers. In larger communities the drop on the primary distribution feeders will account for a considerable percentage of the total voltage regulation. In smaller towns but little of the drop will exist on the primary distribution, most of it occurring in step-down substation transformers and on the high-voltage transmission line. When power plant bus regulation is no longer able to maintain suitable regulation on primary feeders these circuits must be equipped with feeder voltage regulators. Substation transformer taps may be set to take advantage of the most of the range of the regulator.

These methods of sustaining system voltage have no effect in decreasing the actual kva. load carried by the system or in reducing system power losses. In fact, the various induction and step-feeder regulators and transmission line regulators have a tendency to increase power losses. A very useful device for increasing system capacity by reducing the kva. load on the system, at the same time decreasing the voltage drop and reducing the power losses, is the static capacitor. Capacitors on 2,300- or 4,000-volt distribution systems should, in general, be installed at or near the end of primary feeders, as their beneficial effect extends back from the point of installation toward the source of energy. However, if the primary feeder is smaller than No. 4 copper the capacitor will not be particularly beneficial along that feeder as its effect is due solely to the reactance of the circuit, and with the smaller wire sizes the reactance as compared to resistance is quite small. However, a capacitor may often be applied in small communities, not for its effect on the local primary feeders but to reduce kva. load through the substation transformer bank and to hold up voltage on the transmission line.

One to one ratio of gain

A capacitor installation, properly applied, should increase the carrying capacity of the system between the power plant and the point where the capacitor is installed about 1 kw. for each 1 kva. of condenser capacity. The installed cost of capacitors will generally not exceed $10 per kva. Neglecting any increase in carrying capacity on distribution primary

[*Continued on page 88*]

Three Loop Operations Give Different Carrying Capacities

Operating Method	Kw. to Dubuque to Wisconsin Lines	Power Factor to Dubuque (%)	Kw. Delivered Between Dubuque and Prairie du Chien	Kw. Delivered to Prairie du Chien	Power Kw.	Loss (%)	Voltage Volts	Loss (%)
No. 1	2,183	*97.3 lag	1,400	668	115	5.3	2,000	5.71
No. 2	3,311	*93.7 lag	1,400	1,650	261	7.88	3,600	9.84
No. 3	4,189	100 lag	1,400	2,442	347	8.3	3,660	10.0

* Power factor of load is about 80 per cent. Higher values at Dubuque are caused by leading component of line capacitance.

Flooring Quintupled by Motorized Planer

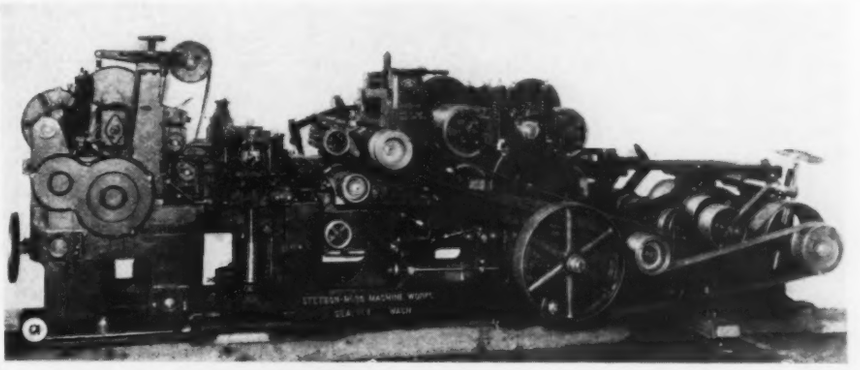
By L. A. BURQUE

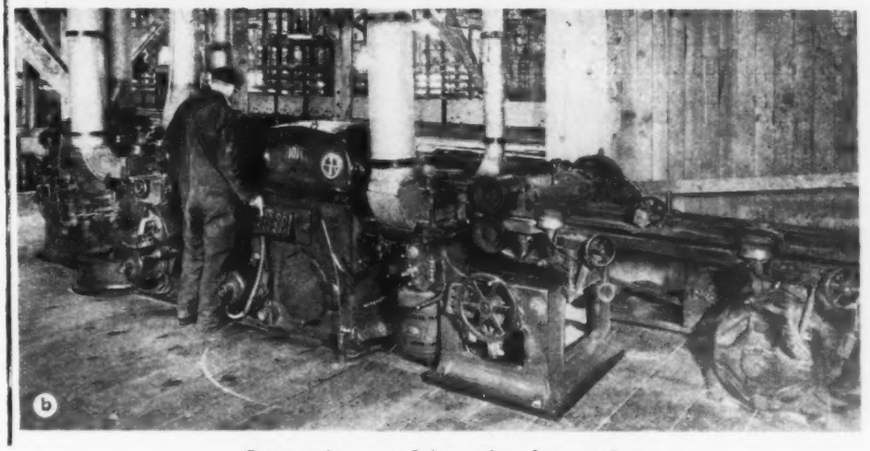
Industrial Division, Westinghouse Electric & Manufacturing Company, Seattle, Wash.

RECENTLY installed in several Northwest lumber mills, including Mill "B" of the Weyerhaeuser Timber Company, Everett, Wash., is a powerful and efficient wood planer which exemplifies the progress that has been made in the modernization of wood- and metal-working machinery by the application of individual and built-in motor and control drive. The co-operation of electrical and mechanical design engineers and the development of diversified motor and control apparatus have made the creation of such machines as this possible.

Both the previous planer (built in 1909) and its modern successor are the creations of the Stetson-Ross Machine Company of Seattle.

On the 1909 model planer (powered by a 50-hp. motor belted to the machine) the maximum production possible was 50,000 lineal feet of 1 x 4-in. flooring. Much of the lumber was degraded, with consequent loss of profit, because of inefficient planing. The machine operator was exposed to physical hazards. Sharpening, setting and truing the cutter head was a laborious process involving removal of head. Nevertheless, these machines were considered marvels of production in their day.





Output increased in ratio of powering

(a) The 1909 machine with belted 50-hp. motor was complicated by belts, tighteners, gears and springs. It took 45 minutes to change cutter head for different size of lumber.

(b) The modern machine, with built-in motors of 330 hp., turns out five times as much flooring. Every motion is driven by a built-in motor excepting the double caterpillar type feed works, which is driven by an external motor. Motors and other rotating parts are inclosed and protected. Motor housings are designed with single-end air intake with cowled openings on outside of machine designed to exclude dirt and sawdust. All motors are controlled by magnetic contactors, and push buttons for complete control of all motors are located at convenient points on the machine. Cartridge type profile cutter heads are incorporated so that a complete change from one type of lumber to another can be made in ten minutes. Sharpening and truing of the main cutter heads can be done in a few minutes or while the machine is running if necessary. Top and bottom cutter head assemblies are hoisted and lowered electrically by individual motor drives, push button controlled. Micrometer indicators on the side of the machine tell the operator position of cutter heads within a thousandth.

Five times the output

Motorized improvements on the modern machines make startlingly new performance possible. One will plane and match 525 ft. of 1 x 4-in. flooring per minute, or approximately 250,000 lineal feet per day. Finished lumber emerges true to size and with a minimum of degrading, skipped spots and snipped ends and edges, representing a further 5 per cent saving over its nearest predecessor. Based on the above production, this alone represents $150 per eight-hour day, or $300 saving on the usual two-shift operation, on which basis these machines have been operating since installation.

Improvement has been accomplished because consideration has been given to selected, individual power units, accurately, flexibly and positively controlled. All cutter head motors are linestart squirrel-cage type, 3,450 r.p.m., 60 cycle, with high pull-out torque characteristics, built for plugging service. The feed motor is a high-starting torque squirrel-cage motor, 1,750 r.p.m., 60 cycle. Hoist motors are high-slip, high-resistance type. On some machines the guide edge jointing head

[*Continued on page 38*]

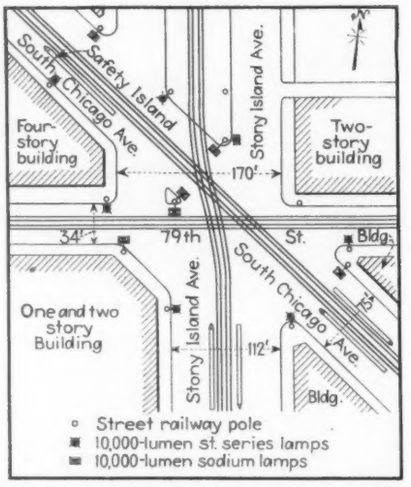
Sodium at Intersections Cuts Accidents 27%

Chicago Utilities Commission Analysis of Extra-Hazardous Intersections Proves Value of Modern Lighting

SODIUM safety lights are being installed at heavy-traffic street intersections in many parts of the country to serve the twofold purpose of providing high visibility for safe seeing and acting as cautionary lights to warn motorists of the danger zone.

Late last year the Utilities Research Commission, Inc., of Chicago, a research organization sponsored by the electric utilities in this area, decided to get definite facts as to the effect of sodium lighting on motor and pedestrian traffic at certain dangerous street intersections in Chicago, with all other factors remaining the same as far as these could be controlled.

The commission wanted to find out how many accidents this yellow illumination of high visibility would prevent. It desired information on the types of accidents the light would affect. If possible, the saving to the municipality in court costs, street equipment repairs, etc., in relation to the cost and operation of the lights, was desired.



Awkward, dangerous type of six-point, three-way intersection found in older cities is typified by this Chicago intersection. See before and after pictures

If sodium lights reduced accidents, the commission wanted to know through what principles, whether by direct illumination, silhouette, difference in color, or increased visual acuity.

The commission has found that accident records in Chicago lend themselves to a study of this kind, the recording and codification of this data being very complete.

Of the 16,000 street intersections within the corporate city limits, 128 (three-quarters of 1 per cent) were found to have an accident frequency eight times the average of all the others. Undoubtedly the same situation exists in other metropolitan centers, with a small percentage of the total intersections accounting for most of the traffic mishaps.

Three different types

From the 128 extra-hazardous intersections, fourteen were picked by the commission. At four of the fourteen intersections the rate of night accidents for the first six months of 1937 was found to be equal to or greater than the rate for the entire year of 1936! Three of these four were chosen for the investigation because of their high night accident records and for the following reasons:

The intersection at 79th Street,

One of 128 extra-hazardous intersections in Chicago is this one at 79th Street, Stony Island Avenue and South Chicago Avenue. Modern lighting increased intensity from 0.28 to 1.31 ft.-candles, as shown on left and right, respectively

South Chicago and Stony Island Avenues is representative of a number of heavy-traffic locations that are of the three-way type. This particular corner has a very heavy interstate and local truck traffic which continues throughout the night. In addition, there are street cars, buses and a heavy flow of passenger cars. The pedestrian traffic is fairly heavy during the rush hours; otherwise it is light. Left and right turns are allowed.

The Chicago and Ashland Avenues intersection is in a heavily built-up section. The vehicular traffic is largely local and moderate speeds prevail, although Ashland Avenue, being one of the main arteries of the city, is used for through-traffic. After rush hours speeds are fairly high. There is a large pedestrian traffic at this corner on account of two nearby movie houses and department stores that are open two nights a week. Left and right turns are allowed.

At Cicero and Diversey Avenues, an outlying intersection, truck traffic is light, but there are trolley buses on Diversey Avenue and street cars on Cicero Avenue. The pedestrian traffic is light. Left and right turns are allowed. Speeds on Cicero Avenue are very high.

Prior to this test the intersections had been illuminated by 10,000-lumen series, incandescent luminaires mounted 20 ft. 6 in. above the street, with the exception of Diversey and Cicero, where 6,000-lumen units were used. Luminaires were mounted on trolley poles using a cast bracket, which brought the units slightly beyond the curb line.

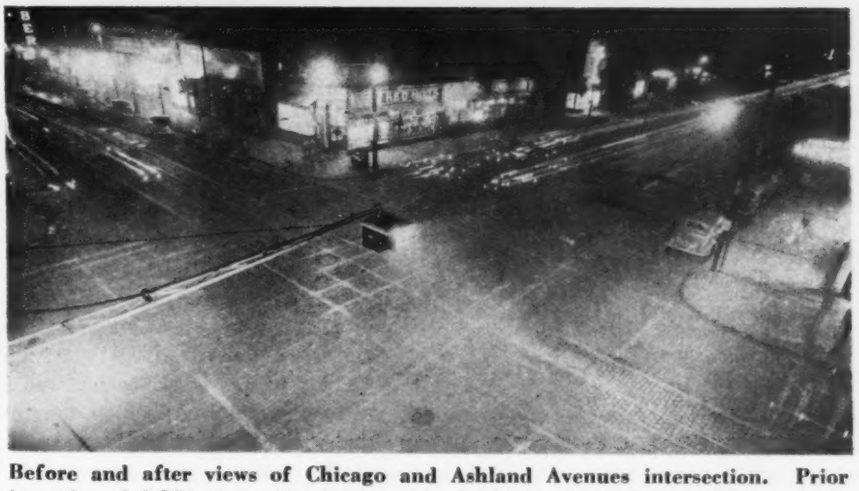
Illumination readings with this equipment showed:

Horizontal Foot-Candles at Street Level

	Maximum	Minimum	Average
Cicero and Diversey Avenues	1.11	0.083	0.311
Chicago and Ashland Avenues	1.29	0.062	0.301
79th and Stony Island Avenue	1.33	0.050	0.280

Seven sodium luminaires of the 10,000-lumen type were installed at 79th and Stony Island and four more were installed at each of the two other intersections at Chicago and Ashland and Diversey and Cicero. Existing trolley poles were used. In order to obtain the proper silhouette effect it became necessary to use 14-ft. mast arms. All lamps were mounted at the 20 ft. 6 in. height. The expense

Typical of dangerous intersections in Chicago is that at Diversey and Cicero. An outlying point, nevertheless trolley buses, street cars and high-speed traffic combined into a hazardous situation, alleviated by increasing intensity from 0.31 to 1.84 ft.-candles



Before and after views of Chicago and Ashland Avenues intersection. Prior intensity of 0.301 ft.-candles increased to 1.944 in this heavily built-up section

of the installations was shared by the Utilities Research Commission and Chicago's Department of Gas and Electricity.

Horizontal foot-candle readings at street level after the sodium installations, with incandescent units in joint operation, show:

	Maximum	Minimum	Average
Cicero and Diversey Avenues	3.27	0.594	1.835
Chicago and Ashland Avenues	4.16	0.772	1.944
79th and Stony Island Avenue	2.97	0.178	1.308

Accidents reduced

Installation of the sodium lamps developed by General Electric engineers was completed November 15, 1937. There has been an insufficient lapse of time to obtain complete comparative accident data at this writing. However, after four months operation of the sodium lamps the total number of accidents at the three intersections compared with the corresponding months in 1936-37 has been reduced 27 per cent, while the total number of persons injured has been reduced 50 per cent. At the end of twelve months enough facts will be had to prove whether or not this type of lighting justifies expansion. Certain facts are already apparent and have been strongly commented upon by the traffic officers and other observers of these intersections, as follows:

1. Pedestrians are in less danger because they are either strongly illuminated or silhouetted at the crosswalks.

2. Similarly, the officer directing traffic is more easily seen. As stated by one of them, "Under the old lighting I could shout, blow my whistle and wave my arms, yet they would try to run me down."

3. Vehicles halted in the middle of intersection by left turns of others, or themselves waiting to make a left turn, are much more readily visible under the sodium lights, and, therefore, collisions are less liable to occur.

4. Obliteration of detail and the otherwise blinding action of opposing headlights is reduced.

5. Color is a factor. The sodium lights stand out distinctly at a distance of several blocks in each direction. Thus, the motorist is warned before he gets to the intersection that something unusual is at the corner. If the use of sodium lights becomes common for dangerous crossings, then motorists will identify them with this use and, even at a distance, will be warned of dangerous conditions.

Prior energizing necessary

There are other comments that should be made on these installations. The lamps were put in series with incandescent lamps operated by the municipality. The circuits were energized at dusk, but the sodium lamps required some time to come up to full brightness. In such cases arrangements must be made to energize these particular circuits 30 minutes ahead of all others, otherwise in any extensive plan of sodium intersectional lighting, the lamps must be carried on nearby multiple circuits of the municipality or the utility.

Another point worth mentioning is the public's reaction to the effect of sodium light on personal appearance. This is a valid objection on residential streets and possibly at intersections in residence territory. However, heavy traffic intersections usually are not in residential neighborhoods. At these dangerous points the sidewalks are lighted by a multiplicity of relatively small incandescent lamps in show windows, signs, white-way posts, etc., and this counteracts any undesirable color effects. Only one person, namely, a young girl drug clerk, has expressed objections to these lights, out of fifty or more persons interrogated.

The thought is frequently expressed that there should be a gradual build-up of sodium light in the streets approaching an intersection intensively lighted by sodium lamps. This has been the practice in rural highway work.

However, there is a difference in conditions between city and rural intersections. At the city intersection there is usually a natural build-up of commercial and street lighting, whereas in rural areas the transition from unlighted to lighted areas is likely to be sudden. When sodium lighting for the three Chicago intersections was first conceived some believed that approach lighting would be necessary. This has not proved to be the case.

Flooring Quintupled by Motorized Planer

[*Continued from page 35*]

is driven by a high-frequency motor, 6,000 r.p.m. at 100 cycles. This is adaptable where a source of high frequency is available in the mill. The machine is powered by a total of 333 hp. in motors, divided as follows:

	Hp.		Hp.
Feed motor	40	Bottom profile	30
Bottom cylinder	75	Outside hog head	30
Top cylinder	50	Top hoist	2
Outside head	30	Bottom hoist	1
Inside side head	30	Guide edge joining head	5
Top profile	40		

With average diversity factor, the load is about 200 hp.

Total weight ..... 30,000 lb.

A control cabinet (located in any convenient place) provides the following features:

Master start and stop—killing entire machine.

Individual overload protection.

An overload on any cutter head motor cuts power off of entire machine. Master start button must be used to establish power again, and then each individual motor is started by means of its push button with the exception of feed motor, which may be started independently.

Pressing reverse button or plugging any motor cuts power on every motor on planer and plugs that motor whose reverse button is pressed. One or more motors may be plugged at one time.

The control is so designed as to prevent lumber piling up in machine in case of accident, overload on any cutter head motor or intentional plugging of any head. At the same time it provides power to feed motor for backing out lumber in the machine if necessary and for operating hoisting motors for clearing and resetting machine. All push buttons are located on machine for flexibility and convenience.

Push buttons at left end of machine control, in order, bottom profile, top profile and feed inching button. The next group inside and outside profile heads, and upper feed bed hoist. There is a duplicate set of push buttons for the matcher motor, located on the other side of the machine for convenience in sharpening and truing this cutter head. The next group controls the bottom bed hoist, top cylinder, bottom cylinder, feed motor and master line contactor. Next and right-hand group controls inside guide edge head, outside hogging head and feed motor. Operators are thus provided with convenient finger tip control from various points on the machine. Plugging on the cutter head motor provides a quick and positive means of stopping in an emergency or when cutter heads are changed or sharpened. The whole machine can be killed by the simple act of pressing a button. The new improved Deïon contactors make possible the small size and rugged dependability of the control cabinet.

Revenue Drops Below Year Ago

REVENUE of the electric light and power industry moved downward in May compared with April, as it usually does. The decrease amounted to $5,535,000, the figure for May being $170,983,100, according to the Edison Electric Institute. This is based on the F.P.C. classification. An accurate comparison with 1937 cannot be made because data for that year are based on the E.E.I. classification, which gave sales to "ultimate consumers" as $173,482,300. This was 6.3 per cent above the $164,014,600 reported for the month in 1936. The most nearly comparable figure for 1938 is the revenue "from sales," $168,996,200, which is below 1937 but above 1936 ultimate consumer revenue.

There has been the usual downward movement since January, but it has been steeper than it was last year. In January revenue "from sales," F.P.C. classification, was $189,826,300; it was almost identical in amount with last year's "revenue from ultimate consumers." But whereas the decrease to May was $16,508,000 in 1937, it was $20,830,000 in 1938. That is, the January figures, whether exactly comparable or not, were on a par for the two years; the May figures differ by 2.5 per cent.

As has been known from the weekly statistics of the E.E.I., energy production is running behind 1937. In May the difference was 9.6 per cent, a slight improvement over the 10.3 per cent in April. In contrast with previous months of this year production from water power fell off more than that from fuels—13.3 per cent against 6.7 per cent.

Total sales of energy, which may be approximately compared with "sales to ultimate consumers" in 1937, were 11 per cent smaller, the difference being chiefly in commercial and industrial consumption. This item was 18.5 per cent smaller than commercial large and small light and power combined, a year ago. In sharp contrast with this, residential sales were above 1937 by 10.3 per cent. They were smaller than in April.

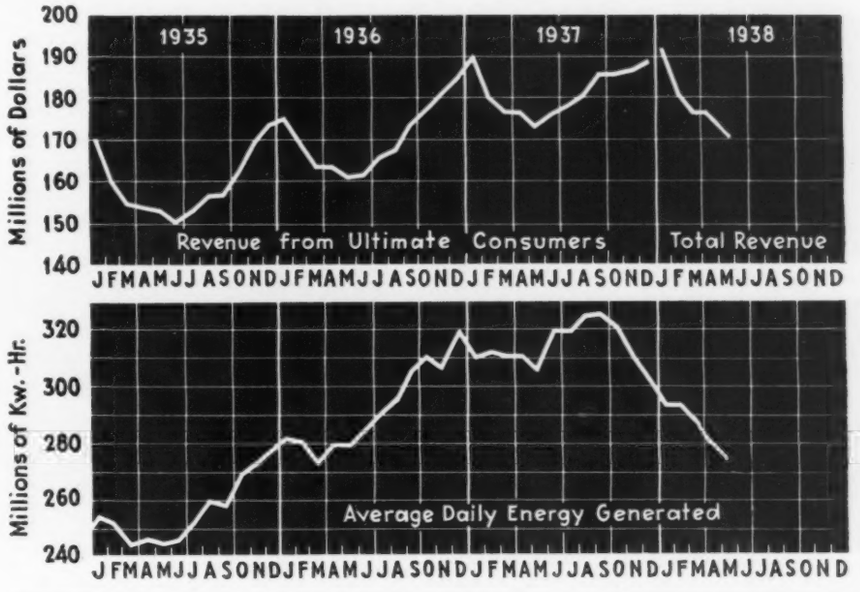

1935
1936
1937
1938
Millions of Dollars
200
190
180
170
160
150
140
Revenue from Ultimate Consumers
Total Revenue
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
Millions of Kw.-Hr.
320
300
280
260
240
Average Daily Energy Generated
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

Table I — Revenue of the Electric Light and Power Industry

(Thousands of Dollars)

Based on F.P.C. Classification, 1938; on E.E.I. Classification, 1937

1938*	March	April	May
From sales†	175,018	174,575	168,996
Other	1,901	1,843	1,987
Total	176,919	176,418	170,983
1937*			
From ultimate customers	177,132	177,184	173,482

*Data not comparable because of an unascertainable amount of "Revenue" in 1938, which may or may not have been included in the 1937 data.
†Excluding sales to other public utilities.

Table II — Source of Energy

(Millions of Kilowatt-Hours)—Compared with Corresponding Month of Preceding Year

Month 1938	Generated						Total Input Incl. Purch.	
	From Fuels		By Water Power		Total			
	Energy	Per Cent Inc.	Energy	Per Cent Inc.	Energy	Per Cent Inc.	Energy	Per Cent Inc.
February	4,925	−10.4	3,288	+0.4	8,213	−6.4	8,592	−5.7
March	5,270	−13.5	3,688	+1.3	8,958	−8.0	9,329	−8.0
April	4,681	−14.7	3,744	−4.0	8,425	−10.3	8,799	−10.1
May	5,024	−6.7	3,574	−13.3	8,599	−9.6	8,980	−9.2

Table III — Comparison of Energy Sales by Classes of Service

(Millions of Kilowatt-Hours)

Based on F.P.C. Classification, 1938	March	April	May	Based on E.E.I. Classification, 1937	March	April	May
Residential or domestic	1,590.2	1,571.3	1,464.8	Domestic	1,413.3	1,413.4	1,327.1
Rural	(Allocated to other classes)			Commercial, small light and power	1,355.2	1,403.2	1,368.2
Commercial and industrial	5,005.9	4,981.4	4,971.9	Commercial, large light and power	4,629.0	4,685.0	4,728.6
Public street and highway lighting	166.4	148.4	136.3	Municipal street lighting	199.2	179.8	163.7
Other public authorities	179.6	163.9	189.1	Railways — street, interurban	420.2	372.1	350.8
To railroads and railways	483.1	445.3	427.9	Railroads — electric, steam	126.0	111.1	103.4
Interdepartmental	34.7	36.0	34.6	Municipal and miscellaneous	83.9	84.7	80.1
Other sales	9.5	8.9	6.7				
Total sales	7,469.5	7,355.2	7,231.3	Sales to ultimate customers	8,220.8	8,249.3	8,121.9

New Cable Fault Locater Fast, Convenient, Accurate

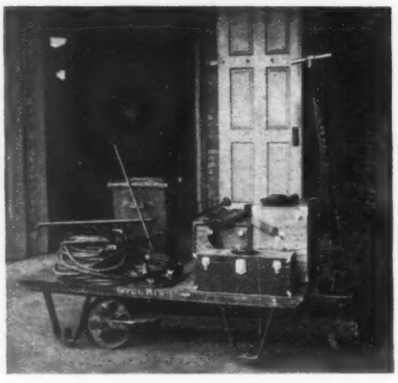
By T. B. MORSE
Public Service Company of Northern Illinois

and C. W. NEWHALL, JR.
Commonwealth Edison Co.

COMPLEXITY and expense of apparatus for locating faults in rapidly enlarging systems of oil-filled cables and the apparently excessive time and labor used in fault location prompted the Commonwealth Edison Company and the Public Service Company of Northern Illinois about eight years ago to undertake an extensive joint research in an effort to improve fault location methods. The results of that research and of the improvements it inspired are embodied in a new fault locater that is compact, conveniently portable and that includes a bridge circuit that will work at any d.c. potential up to approximately 100,000 volts.

The research and development started with a field survey that showed fault location methods falling into two general classes—tracer signal systems and bridge devices (Wheatstone, Murray and Fisher). The first of these systems had been used extensively and successfully by the two companies for a number of years, but as it was used, it required elaborate "breakdown" equipment and it was necessary to patrol the line with the listening devices, which often resulted in opening many manholes and pumping water below cable levels. Also this system was limited on steel-taped cables where the signal had a tendency to carry past the fault.

Most of the bridge systems had been evolved around the so-called "Murray Loop," which has proved itself highly satisfactory when the conditions were proper for its use. However, it was necessary to break down the fault to a low resistance before using the circuit, unless a high-voltage d.c. loop and source of supply were available. A few of these high-voltage loops had been constructed and were giving satisfactory service here and abroad, but to the authors' knowledge, at that time, only one such loop was available on the market (consisting of slide wire and galvanometer only) and this was not satisfactory for the companies' purpose.



The complete test equipment

Loaded on this hand truck is everything needed for field work using up to 7,500 volts on the loop. Included are supply transformer, leads, tools, rubber gloves, etc.

Partly set up

Mounted on the bakelite legs is the instrument containing the loop and bridge circuits, the slide wire potentiometer projecting above. The leads attached are for connection to the faulted cable. Left, below, is the power supply unit.

Comprehensive development planned

Accordingly, it was decided that the companies would work on the development of a loop which could be used on any reasonable d.c. voltage supply, would be simple to operate, would be small and easy to transport and would have a wide range of use and applicability to special bridge formulas. It was also necessary to design special rectifying equipment to accompany the loop.

A number of devices were investigated which claimed extraordinary fault-finding powers, but they were abandoned in favor of the more orthodox approach to the problem. There is nothing basically different in the Murray loop circuit used, but careful determination of the constants was necessary in order to operate satisfactorily at all voltages. Numerous chokes, shunts, arcing gaps, etc., were developed to reduce the effects of induced voltages from adjacent cables or of transient currents set up by intermittent discharge at the fault and accentuated by the capacity effect of the cable.

The result of this development is a

loop unit about 11x12x22 in. in size, weighing about 42 lb., which is entirely self-contained with all necessary auxiliaries. A spiral slide wire approximately 185 in. in length is used which results in a readability of better than 1/100 of 1 per cent of the resistance of the wire and, since a standard commercial make of wire was adapted to the circuit, the cost is a fraction of the cost of a specially designed wire. With a permissible range of 100 to 100,000 volts d.c. it is probably safe to say that this unit will locate better than 80 per cent of the cable failures on the Edison and Public Service systems with a considerable saving in time and increase in accuracy. This includes high-voltage oil-filled lines, regular distribution cables, steel-taped feeders or low-voltage communication lines. Special formulas and connections have been developed which have materially increased the scope of the equipment. A plain Wheatstone bridge circuit is also included in the set for determining cable resistance.

Procedure formulated

In the development of the source of d.c. supply investigation indicated that the majority of the faults could be located with 7,500 volts or less.

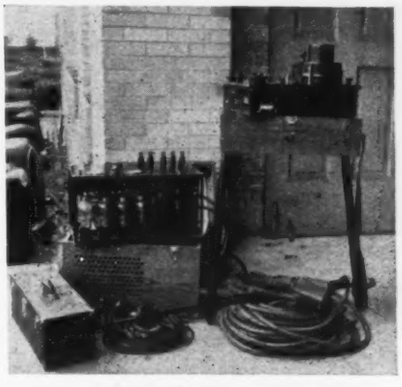
Accordingly, a rectifier set about 12x15x24 in. in size and weighing about 68 lb. was developed. Four mercury-vapor tubes are used in a bridge rectifying circuit providing full wave rectification with single-phase, two-conductor input. A large variable resistor is provided inside the set to limit the output current. The plate or high-voltage a.c. supply transformer is not included in the set. Instead, a special 115/7,500-volt external transformer is employed or else three 1-kw., 115/2,300-volt standard distribution transformers are connected in parallel on the low side and in series on the high. The mercury-vapor tubes were chosen since they represented the cheapest practical means of obtaining a uniform current output over the wide voltage range from 115 to 7,500 volts. This is an essential characteristic. Considerable experimental work was necessary to reduce the size and yet insulate the parts sufficiently to avoid breakdown or corona and brush discharges within the set. The supply set also contains an auxiliary circuit, change-over switch and low-voltage transformer for use in determining the approximate resistance of the fault.

When voltages higher than 7,500 are needed a 30,000-volt half-wave single tube Kenotron rectifier is employed, and if still higher voltages are needed a 400,000-volt permanently installed Kenotron unit is available. These units, however, are not a part of the small portable apparatus and will not be discussed further.

In locating a fault the operator goes to one end of the line to ascertain whether he has proper conditions for the use of the loop. This may include the case where *all* conductors are faulted, in which event the condition is compensated for by the use of a special formula. He proceeds to measure the approximate resistance of the fault with the test circuit in the supply set. This gives him a clue to the voltage which may be necessary to maintain a current flow through the fault. After connecting two conductors at the opposite end, he measures the resistance of the resultant loop with the Wheatstone bridge circuit to determine if the conductors are continuous and unbroken and that all connections are tight. If this resistance is satisfactory he changes to the loop circuit, energizes the supply set and, with the loop set short-circuited, increases the voltage (irrespective of what may be necessary, up to the limits of the set) until a steady flow of current is maintained through the fault. He then removes the short circuit from the loop and balances the bridge circuit.

Method of operation

The operator, wearing rubber gloves, manipulates the slide wire potentiometer and other controls with bakelite rods.



Out of the cases

This view shows the compact arrangement of the power supply, the four mercury-vapor rectifiers and to the right of them the panel on which change-over switch is mounted.

Diversified results accurate

The accompanying table shows the results of some cases of trouble that have been located with this equipment and the high degree of accuracy attained. Errors greater than the 1/100 of 1 per cent previously mentioned result from errors in the records of line lengths and from manufacturing and thermal variations in the conductor resistances. The total length of the line is, of course, used in the calculations.

A few other actual results might be briefly mentioned:

1. Laboratory test of a section of 132-kv. oil-filled cable with oil gushing from fault during the location. Operating voltage 80,000. Accuracy 1/100 of 1 per cent.

2. Field tests at Evanston, Ill., on

[*Continued on page 89*]

Results of 20 Actual Cases of Underground Cable Trouble Located with Morse-Newhall Loop and Direct Current Supply Set

No.	Operating Voltage, Kv.	Length, Feet	Cond. Size in M. C. M. or A. W. G.	Appox. Fault Resistance in Ohms	Bridge Measuring Voltage	Error	
						Feet	Per Cent
1	4	5,420	375	10,000	135	10	0.19
2	4	6,461	375	Very high*	7,000	20	0.31
3	4	5,521	375	120,000	1,250	13	0.24
4	4	13,587	375–350	1,500,000	10,000	246	1.81
5	4	3,533	No. 0	Very high*	12,000	41	1.16
6	9	31,455	No. 4/0	100	135	3	0.01
7	9	21,101	600–500–250	Very high*	5,000	42	0.20
8	12	23,845	500	10	135	19	0.08
9	12	16,623	500	Very high*	4,000	21	0.13
10	12	3,905	650–300–250	4,000	5,000	2	0.05
11	12	4,250	500–350–250	600,000	5,000	101	2.38
12	12	3,780	650–500	Very high*	7,500	10	0.27
13	20	23,650	350	Very high*	20,000	99	0.42
14	22	73,148	350	30	135	135	0.18
15	22	72,270	350	200,000	2,500	17	0.02
16	22	72,270	350	900,000	3,000	338	0.47
17	22	72,270	350	100,000	10,000	84	0.12
18	66	52,798	750	25	135	110	0.21
19	66	34,755	750	40	135	1	0.00
20	66	39,799	1,000–750	2,500	350	24	0.06

* "Very high" means that resistance was so high that it could not be accurately measured with the equipment available.

Note— It is interesting to note that the average error on 63 cases during the year 1936 was 57 ft. or 0.24 per cent. In 1937 the average error on 96 cases was 63 ft. or 0.4 per cent.

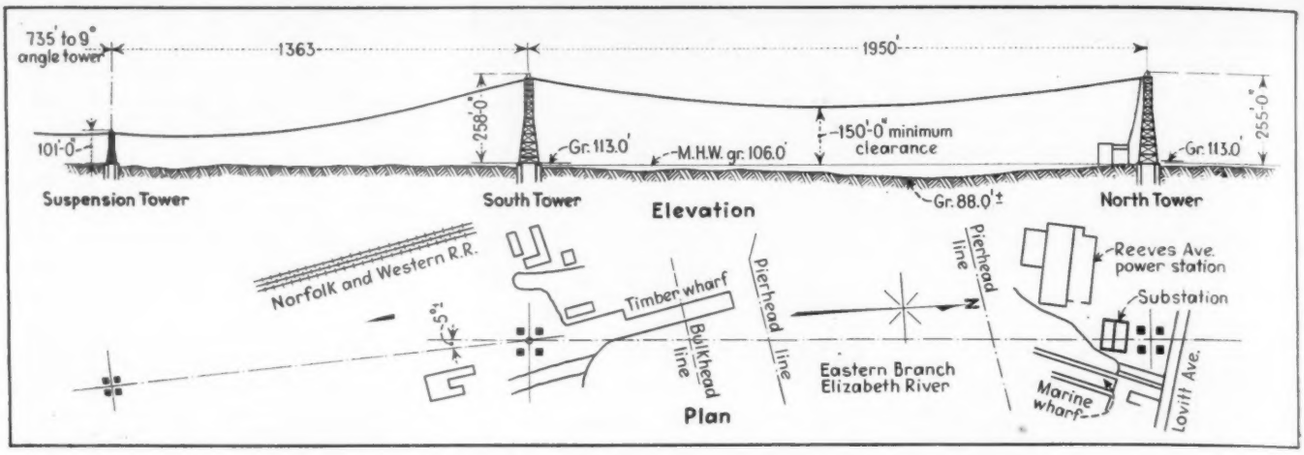


Fig. 1—Plan and profile of 132-kv. river crossing span and tower location

Crossarms are 104 ft. 6 in. long. Bases are 60 ft. square. The soil conditions on both sides of the river consist of an overlying cinder fill for a maximum depth of 10 ft., with river mud, soft clay, silt and sand extending for a further depth of about 40 ft. to coarse sand and gravel below. The towers were constructed on concrete piers supported on creosoted wood piles. Ground levels on both sides of the river are only a few feet above sea level, but the savings effected in the foundation cost due to elimination of need for protection against menaces referred to above, and to somewhat drier ground conditions, more than offset the additional cost in height of the structure necessitated by moving the towers further back from the water.

Tower Access, Safety in 132-Kv. River Crossing

By R. R. WISNER and H. W. FURLONG

Electrical Engineer *Structural Engineer*
Stone & Webster Engineering Corporation

CONVENIENT access to every part of the structures involving maintenance attention as well as safeguards against injury to persons, property and service interruption feature a recently completed 1,950-ft., double-circuit 132-kv. transmission crossing of the East Elizabeth River at Norfolk, Va., on the system of the Virginia Electric & Power Company, a subsidiary of the Engineers Public Service Company. In a congested seaport area, illustrated by this territory, river crossings often present interesting engineering problems. The new crossing requires main structures nearly 260 ft. high, each tower weighing about 150 tons, with cables strung to meet the War Department's minimum clearance requirement of 150 ft. at mean high water.

The general location and profile of the crossing are given in Fig. 1 and the accompanying illustrations show the congested condition prevailing in the vicinity. The main crossing towers are both sturdy and graceful in outline, with unusually complete and safe means of access afforded to every part of the structure where maintenance attention may be needed.

The new crossing serves as an interconnection between the Norfolk steam power station and other power sources of the company, the river having previously been crossed by means of low-tension submarine cables. The river bed varies in depth from 15 to 25 ft. below mean low water in the vicinity of Norfolk, and although used largely by small ocean-going vessels, the river is not navigable for large ships. The possibility of future dredging and widening of the river channel precluded the use of submarine cables as a safe means of crossing the river to transmit the additional power which the increasing load demands.

Design problems

In determining the location of the crossing the following types of design were considered:

(a) A dead-end structure on the roof of the Norfolk steam station on the north side of the river and a suspension type main tower with tie-back steel anchor structure on the south side of the river.

(b) Suspension type main towers on each side of the river with tie-back steel anchor structures beyond each tower.

(c) Two main anchor type towers on each side of the river.

The proximity of the power house stacks, the likelihood of corrosion to conductors and ground wire from flue gases, the liability of insulator flashover due to soluble flue gases and fogs, and other obstructions and difficulties, eliminated the consideration of constructing a get-away structure on the roof of the present power station.

In view of the difficulties and cost of acquiring additional property on the congested area adjacent to the company's property at the Norfolk station, which is located within a few blocks of the center of the city, and the desirability that a small angle in the line be provided at the south side of the crossing to avoid further acquisition of property, it was decided to adopt deadend construction for both main towers, which let the north tower be located wholly on station property.

In consideration of possible damage from prevailing heavy shipping traffic in the river, fire hazards from adjacent marine timber structures or boats, also future possibilities of further widening of the river and extension of the bulkhead lines, towers were placed as far back from the river as property limits would permit.

Parabolic attractiveness

An effort was made to obtain attractive looking structures (Fig. 2) at no extra cost by maintaining a parabolic slope of the tower legs and well proportioned crossarms above.

The cables were arranged in horizontal configuration, which facilitated the installation of vertical down-cables from the tower to the substation immediately adjacent at the station end of the crossing.

A twin lamp unit is provided at the pinnacle of the tower, red lights at the extremities of each crossarm and at alternate diagonal corners at third points in the height of the tower mast. Also, narrow-beam, high-intensity floodlights for the illumination of cables at night have been installed on each tower.

Access to towers

For high structures of this character it is believed that both convenience and safety more than justify the cost of the independent ladder structure (Fig. 2) and complete walkway system (Fig. 3) provided to give direct access to all lights and insulator assemblies on the tower. The separate ladder structure conveys a real sense of security to the individual ascending the tower to replace lights or insulators or for any other maintenance work. This structure, at the same time, provides support for the otherwise excessively long horizontal bracing system at the lower portion of the structure.

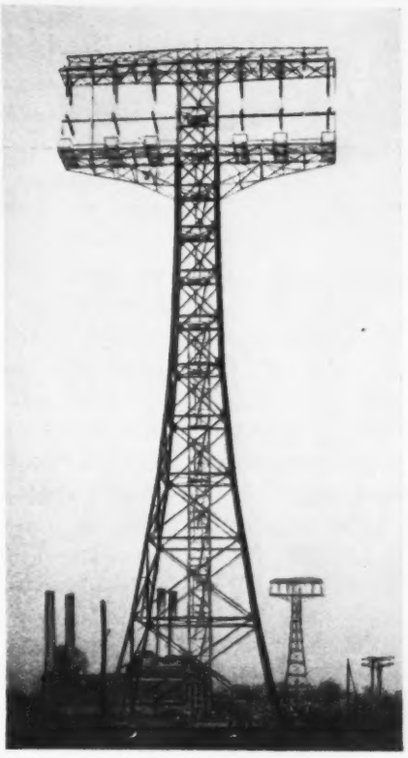


Fig. 2—River span looking toward Norfolk steam plant

The main leg members are 12-in. rolled wide-flanged column sections, which emphasize the outline of the tower, eliminating, as far as possible, secondary members, thereby simplifying the fabrication and affording a more definite stress distribution in the structure. Access to the top of the main towers is secured by a continuous ladder system supported by a separate structure at the center of the tower, with resting platforms 15 to 20 ft. apart, each provided with grating floor and hand railing. A grille with padlocked door at the base of each tower and at each crossarm platform level is provided as safety measure.

The cables selected for this crossing for all six conductors and two static wires were composed of nineteen No. 9 copper-copperweld, each cable consisting of a seven-wire core of extra high strength copperweld and twelve-strand layers of hard-drawn copper on the outside, the completed cable having a breaking strength of 18,400 lb., conductivity equivalent to 183,200-circ.mil copper and resistance of 0.0578 ohm per thousand feet at 68 deg. F. The above cable was selected on the merits of adequate power capacity combined with structural efficiency and economy of design of the tower structures.

Line conductors of the crossing span are anchored by means of single sixteen-unit, 10-in. disk insulator strings, the units guaranteed for a combined mechanical and electrical strength of not less than 25,000 lb. Strain clamps are of the bolted type with a slip rating of

[*Continued on page 91*]

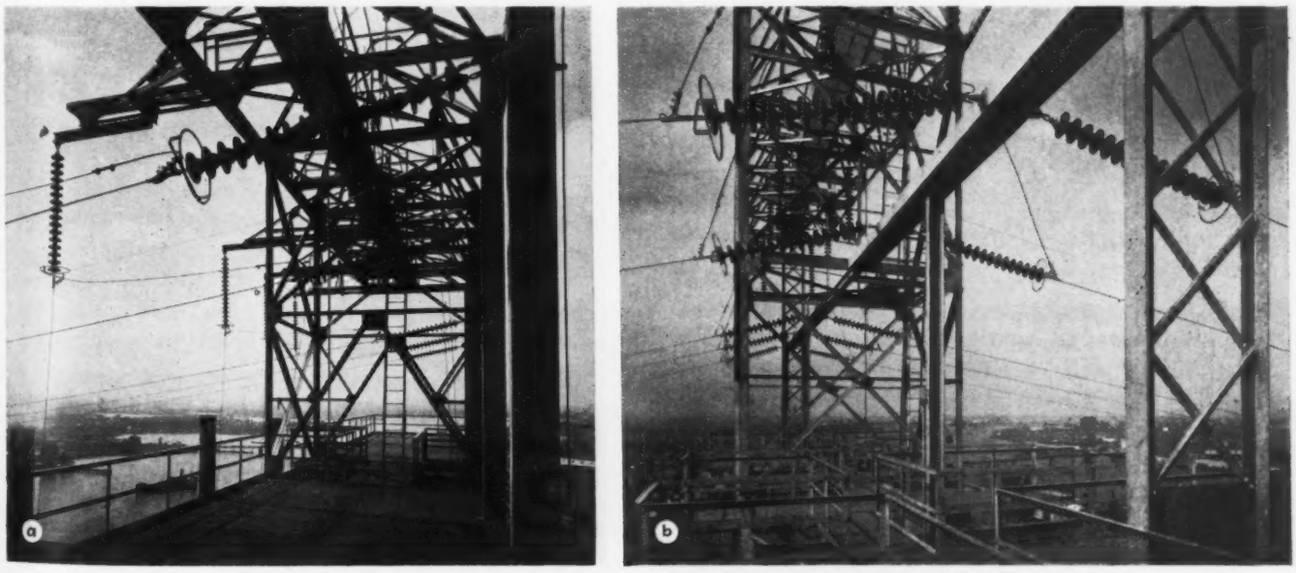


Fig. 3—Walkways afford access to all lights and insulator assemblies

(a) North tower, bottom crossarm. The down-cables, connecting the north tower to the substation are attached to the end of insulator strings connected to hinged brackets normally rigid, but which by removal of a bolt swing in toward the tower by gravity action produced by a slight inclination of the supporting hinges with the vertical axis of the brackets. These brackets are thereby swung in toward the tower, should repairs to the insulator assembly be necessary. The insulator assemblies are anchored to the crossarms so that the insulators are directly above the maintenance walkways. (b) South tower, bottom crossarm.

Editorials

S. B. WILLIAMS, Editor

Will the Committee Look at Both Sides?

THE TVA hearings moved this week to Chattanooga to take up another phase of the investigation—anti-TVA propaganda of the private utilities.

What the committee will unearth in the way of anti-TVA propaganda or how significant it will be remains to be seen. Certainly, if the committee could investigate the opinion of the private utility industry it would be found decidedly anti-TVA—and why not? Here is a government agency in competition with private industry subsidized with taxpayers' money, with arbitrary allocations of the cost of power and selling at what was proclaimed to be a "yardstick," yet which bore no relation to its costs, let alone to competitive costs. Surely it is not yet a felony to fight to protect one's property.

The big question is whether or not the committee will investigate both sides of the question. Will it look into anti-private company propaganda and operations on the part of TVA? Will it give the taxpayers an opportunity to decide whether they want their government, or any agency thereof, to engage in commercial sabotage?

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The Minimum-Use Customer as an Asset

FOR a great many years most utility companies have been accustomed to deplore the existence of the low-use and the minimum-use customers and to feel that, like the poor, we shall always have them with us.

However, in more recent years many companies have made it a point to undertake real analytical studies of this group of accounts and have found that back of these meter accounts are people, real people, with electrical wants to be satisfied, with a substantial aggregate purchasing power and constituting a broad market for our products and service.

Out of explorations of this nature one service company, for example, coined the term "un-sold customer" and uses it with telling psychological effect upon its own sales force as well as upon the prospects themselves. Other companies, well provided with both purses and patience, have used major appliances to reduce the proportion of low users on their systems, while practically all of the companies at one time or another have used Better Light-Better Sight as a selling tool, particularly for this class of business.

One of the latest programs coming to our attention is a campaign directed to both urban and rural domestic users which offers major as well as minor appliances for "a nickel a day" or "a dime a day." Service to the appliance being purchased is controlled through a collector which handles up to twenty coins, and being portable, is transferred to another appliance when payments are completed.

The same company is selling these users hundreds of ovens (it costs a dime to call them by their ordinary name of "roaster") and is experimenting with 1½-gal. electric water heaters thermostatically controlled which hang on the wall over the faucet and are plugged into a convenience outlet. So far these heaters are proving to be worth 90 cents a month to the utility.

These selling advances upon a problem common to all utilities are an encouraging note to every man and woman on a utility payroll. For they signify the recognition of a broad source of new gross earnings and they show that utility sales forces and utility management are willing to try for this business with sound selling procedures.

It may well be that the erstwhile bane of utility operations may turn out to be an asset after all, not only because the low-use customer represents a market which has not yet been fully tapped but also because the process of selling this market may cause the industry to reorient its own thinking somewhat so that it can find more ways of solving its own problems by first solving the customers' problems.

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New Jobs for Reddy

REDDY KILOWATT is getting to be a big boy. The job of selling the home and keeping the housewife happy with her electric service was not enough for the growing strength of this young fellow. Now he has also taken on the same job for the commercial and industrial customer.

It has not been easy to advertise to these two groups of customers, probably because the thing the utilities had to sell was not so much the quality of a product as the quality of a service. By injecting a personality into the message Reddy can do a lot to sell the intangibles of purchased power, which by and large are much more important than price.

In addition, Reddy can be of immense value by nationalizing the talking points of electric service to these commercial and power customers. We need to tell the same story everywhere. The more we do, the sooner will acceptance come.

And all the while Reddy is selling service he is

making friends. He has done a fine job with the women and children. He can do an even bigger job in the commercial and industrial field by telling what he has done and is doing to develop the community, to create a better market for his customers, to improve living and employment conditions.

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Engineering Arbitration of Bulk Power Contracts

CONTRACTS between power companies for energy supply in bulk properly carry arbitration provisions in even the most friendly situations. Changing load and system plant conditions would otherwise threaten the mutual profitableness of such agreements. and the arrangement might become either irksome or of nominal value. Public interest is conserved by an arbitration provision which may call for a review of terms at stated times or when renewal looms upon the horizon and demands a decision considerably in advance of the expiration date in order that engineering problems allied with power delivery may be solved with due deliberation. The specification and ordering of new equipment for generation and transmission bear such an intimate relation to contracts for power supply or interchange that the time element in contract renewals is supremely important. One or two years is far from an excessive allowance for adequate preparation and negotiation where substantial blocks of energy are involved.

In the past there has been a tendency to place the burden of such arbitrations upon men selected by representatives of each company, or in the event of failure to agree upon personnel, upon one or more arbitrators chosen by the courts or by the regulatory commission in the territory. Sometimes one or more commissioners perform the task, and here experience in rate and capitalization cases may be highly valuable in applying a contract to changed conditions. More and more the best engineering judgment is being required in determining fair prices for delivered energy. Such questions as the value of primary vs. secondary power, the cost of building a local steam or hydro plant to supplement or supersede the existing sources, the effect of new or modified plant on system economies, savings attained in past operation by interconnection, trends of load incidence and magnitude, evaluation of service reliability in relation to specific types of customers and the fitness of existing plant in relation to progress in design are too technical to be weighed by arbitrators unfamiliar with operating and engineering problems.

The situation can be most uncomfortable if the parties rely upon even a highly judicial layman to decide between the contentions of the opposing engineering specialists. Wage arbitrations may be successfully conducted by bankers, lawyers and publicists, but in power price determinations engineering may well share a seat at the bench. Too much technical judgment is called for to proceed otherwise as the value of power blocks involved in such agreements increases.

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Fluorescent Lamp Equipment Design

WHEN new lamps are introduced equipment manufacturers are eager to bring out new products employing them and there is a mass movement to design what frequently turns out to be a heterogeneous "line" of equipment, which does not always prove profitable to either the lamp or the equipment manufacturer. One need only remember two or three of the less significant developments of the past decade to recall vanishing lines of luminaires the design of which was predicated upon false premises of either the extent to which the lamps could be used or the value which the ultimate consumer would place upon the new product.

Two guideposts should assist equipment manufacturers in their approach to the new fluorescent lamp line—first, their experience with lumiline lamps, a tubular source of lower efficiency and restricted usefulness, and, second (more a temporary mooring than a guidepost), the proving grounds offered by the 1939 World's Fairs in New York and San Francisco.

The experience gained in the design of lumiline lamp units should prove of immeasurable assistance. Up to 1932 most equipment employed lamps of "point source" distribution. During the several years of lumiline lamp design, the designer has developed considerable flair in the use of the linear sources, and it should not be hurriedly supposed that the fluorescent lamp is going to supplant it.

Rather, the fluorescent lamp is a new illuminant which gives the lighting designer linear sources of higher brightness, brightnesses which will need study and care in their application and not mere substitution. Since the application of lighting knowledge of the day is generally reflected in the buildings at expositions and fairs, the designers whose work will be displayed to the public in 1939 in May should give us a picture new and significant in the application of decorative lighting.

The ELECTRICAL WORLD (published under that name since 1883 and tracing its history back to 1874) is a consolidation of the *Electrical Engineer* (founded in 1882 as the *Electrician*) and the *American Electrician* (founded in 1896). Final consolidation under the title of ELECTRICAL WORLD took effect on January 1, 1906. the ELECTRICAL WORLD and the *Electrical Engineer* having been acquired by the McGraw Publishing Company in 1899 and amalgamated as the *Electrical World and Engineer*, and the *American Electrician*, a McGraw monthly, having been absorbed seven years later.

The Purge for Power

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

ONE night in the summer of 1929 the writer was sitting in a Savannah newspaper office talking to a little group of Georgia newspaper men about the tariff — whether the much-talked about industrialization of the South would change the traditional free trade attitude of that section. Lots of items were mentioned on which the local authorities thought tariff protection would benefit their section economically.

"How about cement?" the writer inquired. "Doesn't that come over from Europe in ballast?

"Oh, we don't care anything about cement," explained an editor. "We have a city ordinance here which prohibits the use of imported cement."

"For heaven's sake," the writer marveled, "are the local cement companies as potent politically as that?"

"It's not the cement companies," the editor explained patiently, "it's the railroads. They want the haul on the domestic cement. It's 300 miles to the nearest mill—up near Atlanta. And it isn't just the railroad management—don't get the idea. It's the railroad workers. You'd be surprised how alive they are to anything which threatens to cut down their time."

St. Lawrence needs votes

All of which is of extraordinary interest at the moment because of two of President Roosevelt's present activities—the "purge" of independent Democratic senators, and his appeal to the people of Canada over the heads of a government far from enthusiastic over Roosevelt's dream of harnessing the St. Lawrence.

For in Georgia this attitude just described resulted in Senator Walter George, now threatened by the "purge," voting against ratification of the St. Lawrence seaway treaty. It also resulted in his colleague voting against ratification. As a matter of fact, from Maine to Florida, down the Atlantic Coast, the President had only the votes of two senators on his side, one from New Hampshire and the other from South Carolina.

The South Carolina vote against him was that of Ellison D. Smith, whom the President is also trying to purge this year. Millard F. Tydings of Maryland, also on the purge list, also voted against the St. Lawrence project, but it is interesting to note that his opponent, David J. Lewis, though he keeps "reading the record" of the anti-New Deal votes cast by Tydings, has never referred to the St. Lawrence project as one of them, despite the fact that President Roosevelt has forced this issue again by his Canadian speeches.

The Atlantic and Gulf states, on the last roll call on this treaty, rolled up 30 votes against it without counting Florida, both of whose senators were absent and unpaired. It only takes 33 votes to beat a treaty, because it requires a two-thirds majority to approve it.

Naturally, the whole shipping industry of every Atlantic port is against a project which would divert some of its city's export and import business to Montreal and the Great Lakes ports, though how the effects of this would extend further south than, say, Norfolk has always mystified the writer. Naturally, also, the railroads serving those ports are vigorously opposed to a project which would deprive them of such vitally needed tonnage. Naturally there was no enthusiasm in New Orleans when the President pointed out how like going round Robin Hood's barn it was to ship a piano from St. Louis to New Orleans, and then out through the Gulf of Mexico, instead of shipping it the short distance to Chicago and loading it on a steamer there that would go down the St. Lawrence.

But the President must pick up a few votes from the Atlantic and Gulf states to get the seaway treaty ratified.

He thinks he has already the two Florida senators, whose predecessors absented themselves without bothering to pair. He thinks he has Radcliffe of Maryland, though Radcliffe has demonstrated an independence very annoying to the White House in supporting his colleague Tydings. He hopes to gain another if Koppleman beats Senator Lonergan in Connecticut, one if Lewis beats Tydings in Maryland, one if Earle beats Davis in Pennsylvania and one if Ely beats Barbour in New Jersey. These, added to the Georgia vote he is counting on, would make a gain of eight —enough to obtain ratification.

Virtually all of the Middle West and Northwest senators are enthusiastic for the treaty. Their zeal was at least intelligently selfish a few years back, when the project was first advocated. At that time the U.S. was a great grain exporting country. Northwestern farmers were educated to believe their wheat could be moved to Liverpool very much more cheaply by the seaway, and that every penny of the saving would be theirs — in an increased price for their grain. The only other enthusiasm for the seaway project comes from the Great Lakes cities, which rather fancy themselves as world ports.

Power cost

But Secretary of Agriculture Wallace is now admitting that every bushel of wheat sold abroad this season will be sold at a loss. For the future Wallace proposes that quotas limit the wheat production of this country to domestic consumption. So what becomes of the benefit the St. Lawrence seaway is to bestow on the Northwestern farmers?

Moreover, the whole argument presupposes that the seaway will not charge tolls. If it does not, then the entire cost must be "allocated" to power. There is no flood control problem involved, and a "national defense" motive would indicate use

[*Continued on page 83*]

News OF THE WEEK

TVA Group at Chattanooga Sifts Fight Against City-Owned Plant

Congressional committee hears that utility contributed funds to block bond issue to build system for TVA power — Examination brings out that Senator Black's committee knew of funds to citizens' group

Suddenly shifting its base of operations from Knoxville, TVA headquarters, to Chattanooga, the special congressional committee investigating TVA listened to witness after witness tell about the fight, in 1935, to prevent duplication by Chattanooga of the existing electric distribution facilities, owned by the Tennessee Electric Power Company.

Evidence was also heard of the various alleged dilatory tactics of the power interests aimed at preventing this duplication, and fears of the public ownership advocates that if the company remained in business, thus providing competition for the public ownership system, the financial results for the public ownership venture might not be as rosy as had been anticipated.

Hearing shift a surprise

The committee's sudden change of base was a surprise move to most of its membership. For weeks investigators borrowed from Harold Ickes' PWA had been seeking evidence in Chattanooga as to details of the fight. Committee Counsel Francis Biddle proposed to the committee on August 22 that a subcommittee go to Chattanooga for this hearing, but on protests by some of the Republican members, Chairman Donahey held that the entire committee, or at least as many of its members as could be mustered, should make the trip.

"We could not have won if we spent $10,000,000 instead of barely over $23,000," Paul S. Mathes, treasurer of the citizens' and taxpayers' committee which fought the $8,000,000 bond issue for the municipal project, told the Congressmen. "The argument against us was that if we did not vote for the bond issue the Chickamauga Dam, which was to cost $36,000,000, would not be built right outside our city."

Mr. Biddle laid great stress in examining Mr. Mathes on the fact that of the $23,000 his committee spent, $20,000 was contributed by Commonwealth & Southern, the first check being $7,500, the second $2,500 and the third on an appeal to help with the deficit after the fight had been made and lost, for $10,000.

Representative Wolverton brought out in cross-examination that all of these points, including the contributions of Commonwealth & Southern, had been gone into by a grand jury investigation, and later by the Black committee investigating the propaganda campaign against the holding company act.

Board created by act

Representative Jenkins brought out by questioning Will F. Camlee, counsel of the Electric Power Board of Chattanooga, that the board had been created by special act of the Tennessee Legislature from Chattanooga alone, that its members had been named in the legislation and that vacancies on this board should be filled by the board itself, subject to confirmation by the Mayor and City Council.

Mr. Camlee also testified that the rates charged by municipally owned systems in Tennessee are not subject to control by the Tennessee Railroad and Utilities Commission, though rates of privately owned utilities are. L. J. Wilhoite, acting chairman of the Electric Power Board, said the estimates of his engineers were that if the Tennessee company continued to operate in Chattanooga, and the public operation obtained half the business, gross receipts would be $1,413,295 a year, and estimated costs, including bond interest, retirement, TVA power charges and $115,243 a year for improvements, would total $1,238,781, providing an annual surplus of $174,514.

Having been in business himself, however, he admitted to the committee he did not accept these estimates at face value, but feared that perhaps if such competition ensued it might be necessary to level the special taxes provided in the act in order to pay the interest on the bond issues, of which $8,000,000 at 4 per cent is provided, money to be provided by PWA.

One thing he was much afraid of, he said, was a rate war, which he called an "unfair attempt to dynamite" the public ownership venture.

"Is your main interest getting cheap electricity for the citizens or in establishing public ownership?" inquired Wolverton.

"Cheap electricity for our citizens," said Mr. Wilhoite, who insisted the Tennessee commission should stop any such "dynamiting" attempt.

"But does not the Tennessee law require the company to charge the same rates in all comparable sections of the state?" asked Mr. Wolverton.

Mr. Wilhoite admitted it did, and said he did not think any concern should cut rates below cost.

Details of the negotiations for the purchase of the Tennessee company property were left suspended in mid-air. Mr. Wilhoite said he had offered $6,200,000 for the Chattanooga distribution system and has proposed buying one or more of the four generating plants of the company, one of which, Hale's Bar, he had been told by Mr. Lilienthal, was regarded as essential to the TVA development.

Mr. Wilhoite said his estimates for duplicating the Tennessee Company facilities at Chattanooga was $7,127,427, but that his estimates on depreciation would reduce the actual present value to $4,186,000. Mr. Wilhoite

was particularly bitter about petitions which had been twice circulated in an attempt to get a municipal ordinance which would forbid the erection of any poles or conduits or other electrical facilities in any street where there were already adequate facilities. These came after the election in which the citizens and taxpayers committee had taken part and which resulted in approval of the bond issue by some 19,000 to 9,000; it was developed that this was the only election in many years in which poll taxes were not charged. Mr. Wilhoite said the misrepresentation went so far as to say municipal operation would increase taxes.

Seek petition signers

Signatures to these petitions were sought during a supplementary registration period. Some voters, he said, were given the impression that signing the petition was a part of the formality of registering. Many withdrew their signatures. The first petition failed. The second is still being circulated, he said, and might be sprung at any time.

Asked if Harold Humphreys, who is in charge of the petition, was connected with any power company, Mr. Wilhoite said: "Not that I know of; I wish I knew."

Mr. Wolverton forced Mr. Wilhoite to admit that perhaps his refusal to suspend his construction program might be interfering with David E. Lilienthal's negotiations to buy all the Commonwealth & Southern properties in TVA territory. Mr. Wilhoite insisted that he had held up operations during the sixty-day standstill period suggested by Mr. Willkie, but that further delay would be very expensive to the Chattanooga taxpayers. The city has already completed a transmission line to link it up with Chickamauga Dam, but Mr. Wilhoite said he did not regard that as duplication, as it would be needed in any event.

Electrical Test Farm Opened At Rochester

More than 300 visitors, including representatives of Rochester Gas & Electric Company and electrical manufacturers, attended the opening last week of the Nelson R. Peet farm near Rochester, N. Y. The proving farm was established by Westinghouse Electric & Manufacturing Company in cooperation with the utility and various manufacturers supplying equipment to measure the savings possible through the use of electrical equipment on the farm.

In the Peet home will be found many labor-saving appliances, including a complete electrical kitchen with electric range, refrigerator, dishwasher, appliances and conditioned lighting. There is a planned laundry with washer and ironer. Electric motors are found on the various farm equipment.

Accurate data on the electrification will be available to determine the first cost of equipment, operating costs and man-power required. The farm will be used as an authoritative guide to farm improvement and the savings which can be gained through wide use of electricity.

•

Roosevelt Supports St. Lawrence Power

Last week President Roosevelt made another plea for the development of power and navigation on the St. Lawrence River. Speaking at the dedication of the Thousand Islands Bridge, Mr. Roosevelt said:

"I look forward to the day when a Canadian Prime Minister and an American President can meet to dedicate, not a bridge across this water, but the very water itself, to the lasting and productive use of their respective peoples."

Mitchell Hepburn, Premier of Ontario, at Toronto, said that his government never would give its consent to development of the St. Lawrence River as a waterway and a source of electric power.

"We don't need the power," Mr. Hepburn said. "When the time comes, and I do not foresee it for a long time, the problem will be handled by an extension of the present policy of public ownership."

•

Plant Addition Tax-Exempt

A contract recently filed in the office of the Secretary of State exempts from taxes for ten years under the Louisiana industrial law an addition to the New Orleans Public Service, Inc., costing approximately $2,458,100. The contract was signed by Gov. Richard Leche as the state's chief executive and by L. G. Ireland, vice-president of the utility company. The addition, known as the Market Street steam-generating station, is nearing completion, with work scheduled to be finished by December 31.

OPEN PROVING FARM—Representatives of Rochester Gas & Electric, Westinghouse Electric & Manufacturing and various manufacturers at the opening last week of the Nelson R. Peet farm near Rochester, N. Y., established to measure the savings possible through the use of electrical equipment on the farm. Above, Mr. Peet addressing crowd

Carolina Power & Light Launches Sales Drive to Create New Jobs

Joins in "Sales Mean Jobs" campaign to stimulate customer purchases of appliances as means of increasing employment — Finds purchasing power available and sales can be made through aggressive action

With the harvest season near at hand and the prospects of greater fall business, Carolina Power & Light has entered into an aggressive electrical appliance sales campaign to increase employment and at the same time make available to housewives the electrical appliances they have long sought.

The utility has joined with other business concerns in stimulating business activity through the "Sales Mean Jobs" campaign and from present results the drive is producing good results.

Map action plan

A short time ago Carolina Power & Light called a conference of its sales supervisors and dealer co-ordinators, at which time the procedure of making sales was discussed and a plan of action mapped out. These supervisors and co-ordinators returned to the field and discussed the plan with district managers, distributors and dealers, who in turn passed it on to salesmen of the company and the dealers.

"The actuating objective of our efforts." S. P. Vecker, general sales manager of the utility, said, "is to make every key man, be he manager, supervisor, distributor or dealer, mentally aware of the present-day real need on his part to create a consciousness in the minds of all salesmen—in all classifications—that sales can be made, and that our very existence as salesmen depends upon our locating prospects and converting them into buyers."

Manufacturers and distributors were asked to join in the drive by sending direct mail advertising as an excellent means for creating prospects and stimulating sales. This material was made available for distribution through other channels.

Mr. Vecker stated that results to date in the sale of electrical merchandise "make us feel sure that together—dealer, company, and distributor—we shall accomplish our purpose, more sales mean more jobs."

Analyzes income sources

At the start Mr. Vecker analyzed the condition of the territory served by the utility and the principal sources of income of the inhabitants. It was found that the territory was dependent for its income largely upon farm products and that 1938 farm income would be good. It was also found that sales had decreased more than income and that this situation resulted from a national psychology of not spending because of government and business uncertainty.

In an effort to break the situation and create a better feeling in the minds of the people, the utility started with its sales force to reverse the thinking and to show money was available for purchases of things people wanted. Instead of selling the appliance, sell the value of the service, Mr. Vecker said. "It stands to reason that the salesman will have no difficulty in delivering his product if he creates in the mind of the prospect a desire for the service," Mr. Vecker said. "Consequently, our principal aim was to locate prospects and once again sell service."

As a result of the method of approach, the salesmen found that customers were receptive to the service sales argument and that appliance sales have shown a decided turn upward in the territory. As yet, the full effect of the drive is not being shown in the sales reports, but, as Mr. Vecker said, sales to date "make us feel sure" that the purpose will be accomplished and the sales will mean more jobs.

•

PWA Allotments Made to City Power Plants

Grants totaling $650,587 were approved last week by the Public Works Administration to municipalities for the construction of utility facilities. The largest grant, of $204,660, was to Ottawa, Kan., for additions and improvements to the municipal power plant to cost $454,800. The next largest was to Greenville, N. C., of $168,545 for additional steam-generating capacity to existing plant to cost $374,545.

Other grants to municipal plants included:

Neodesha, Kan., grant of $84,744, total cost of $188,320 for improvements.

Rayne, La., grant of $38,250, total cost of $85,000 additions and improvements to power plant.

St. John, Kan., grant of $36,225, total cost of $80,500 for additions and improvements to power plant.

Burlington, Kan., grant of $12,000, total cost of $26,600 for additions and improvements to existing plant.

Prague, Okla, grant of $31,909, total cost of $70,909 for generating facilities to supply existing distribution system.

Waterville, Kan., grant of $15,345, total cost of $34,100 for improvements to existing generating plant to resume generation of power.

Scottsboro, Ala., was allotted a loan of $72,000 and a grant of $58,909 for a distribution system and substations to cost $130,909 so that the city can purchase and distribute TVA power.

•

Knoxville Utility Sale To Be Made August 31

Tennessee Public Service Company has notified the city of Knoxville and the TVA that it will be able to make delivery by August 31 now that more than the required 80 per cent of outstanding bonds have been deposited under the agreement.

The city has asked for bids on August 30 for $6,000,000 of revenue bills, dated July 1 and maturing 1941-58. The city has asked bidders to name the rate of interest, which in any event must not exceed 5 per cent. The bills are to be paid off from revenue solely derived from operations of the city's light and power system, which purchases its electricity from TVA.

Under the purchase agreement the city can ask for an extension of the date of transfer of the properties to September 10. However, indications are that the $6.000.000 of revenue bills will be sold either to private bidders or funds obtained from RFC and the transfer consummated.

•

Cleveland Sells 908 Ranges

A total of 908 electric ranges were sold in Greater Cleveland, representing a range volume of approximately $125,000, during the recent sales contest.

Beginning September 1 the local Better Light-Better Sight drive will start. Sponsored by the Electrical League and supported by lamp, lighting equipment and fixture dealers, the drive is expected to be the best yet held.

•

Court Order to Restrain Proposed Municipal Plant

In an action brought by the New York State Electric & Gas Corporation, furnishing service at Plattsburg, N. Y., Justice Ellsworth C. Lawrence of the

State Supreme Court decided that a permanent order be issued restraining that municipality from proceeding with the construction of a proposed municipal electric power plant. The city planned to use a total appropriation of $520,000 for the project, through bond issue and federal grant, the latter having been approved by PWA. The court holds that the bond issue for the station and distribution system would exceed the constitutional debt limit of the municipality and has restrained further action for this reason.

•

Bureau of Mines to Build Norris Experiment Station

Establishment of an experiment station by the Bureau of Mines, U. S. Department of the Interior, at Norris, Tenn., has moved a step closer as the result of the signing of a one-year cooperative agreement between the Tennessee Valley Authority and Bureau of Mines, Secretary of the Interior Harold L. Ickes has announced.

Under the agreement the bureau will supervise operation of a laboratory in an enlarged experimental program to promote the utilization of non-metallic minerals found in the Tennessee Valley and adjacent areas.

•

Building to Cost $40,000

A service building for the Shawinigan Water & Power Company, Ltd., will be constructed at Valleyfield, Quebec, at a cost of approximately $40,000.

Rural Compromise Approved by Board

Formally approving a compromise designed to end the dispute over furnishing electricity to Harrison County's rural consumers, the West Virginia Public Service Commission has taken steps to see that fair competition is maintained.

The commission instructed the Monongahela West Penn Public Service Company and the Harrison County Rural Electrification Association that neither may build extensions over 2,000 ft. long from distribution lines without commission consent. The order invalidated the original certificate, the granting of which the utility had threatened to carry to the Supreme Court.

Under the terms of the compromise, the utility agreed to sell to the cooperative certain distribution lines in the disputed territory, and the co-operative dropped plans for a generating plant with the understanding it would purchase power from the utility.

•

Seeks to Buy Properties of Tennessee Utility Unit

Efforts to purchase properties of Kentucky-Tennessee Power Company took on new vigor this week as Mayor A. N. Fuller of Gallatin, Tenn., said that the company had promised to submit a figure for which the company would sell its distribution system to the city. Previously the utility had rejected the offer of the city of $94,744.

PWA has granted the city $76,500 for purchase of the utility system or build a new one. A bond issue of $93,000 will provide the remainder of the proposed cost.

•

Light Aids Discussed at Cleveland School

Primed for increased business, more than 200 electrical jobbers, utility representatives and others interested in secondary distribution discussed new developments and trends in industrial, commercial, aviation and highway lighting at the Westinghouse jobber lighting school in Cleveland this week.

Principal talks included discussion of markets, new designs for better lighting at lower cost and improvements for decreasing maintenance and operating costs. Noteworthy developments for solving pressing industry problems included an exceptionally clever "Locklite" industrial lighting unit, simplified weatherproof designs, a new "brightness control" for aviation contact lights, special luminaires for bi-post lamps and many improvements for store, fountain, service station and athletic field lighting.

Proof was presented that adequate highway lighting materially reduced accidents.

Among speakers at the sessions included J. E. Mueller, manager of commercial sales West Penn Power; R. W. Jeffery, lighting consultant Corning Glass Works; A. M. Staehle, vice-president McGraw-Hill Publishing Company; A. L. Billingsley, president Fuller Smith & Ross, and a group of Westinghouse lighting experts including F. R. Kohnstamm, manager of the company's lighting division.

•

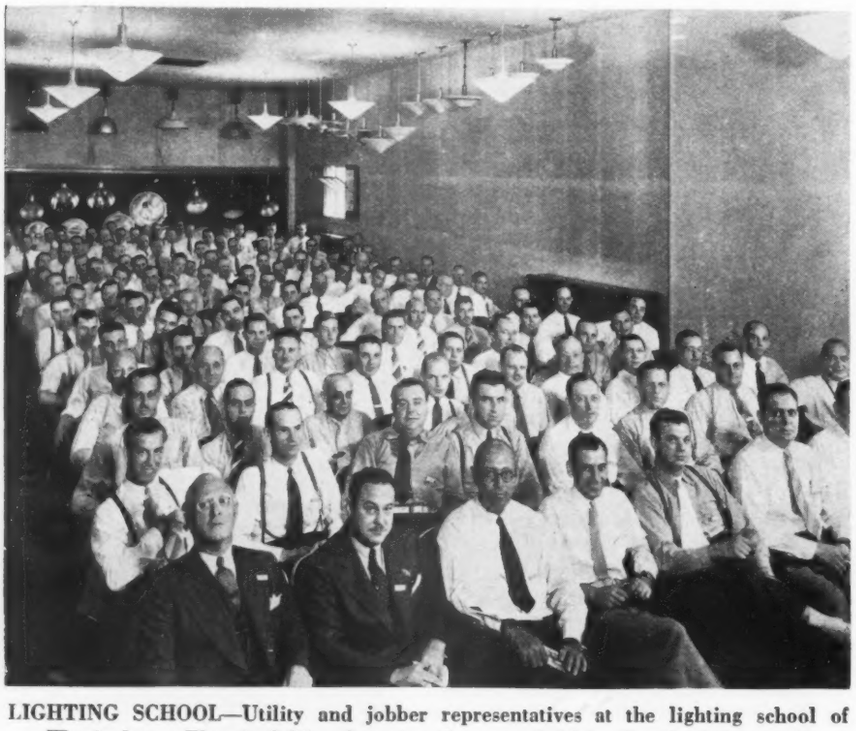
Rumors on Integration

Reports that Commonwealth & Southern Corporation was negotiating with Cities Service Company for the purchase of its Ohio properties were based on the year-old negotiations for the sale of the small system at Adrian. There have been no negotiations for any wide sale or exchange of properties to meet the conditions of the utility act concerning integration, it was said.

•

Toledo Edison Calls Bonds

Toledo Edison Company will redeem on October 13 at 105 per cent and accrued interest all of its outstanding first mortgage gold bonds 5 per cent series due November 1, 1962.



LIGHTING SCHOOL—Utility and jobber representatives at the lighting school of Westinghouse Electric & Manufacturing Company held in Cleveland this week

Production Gains Continue

Output gains slightly over the previous week — It is still 7.2 per cent under 1937

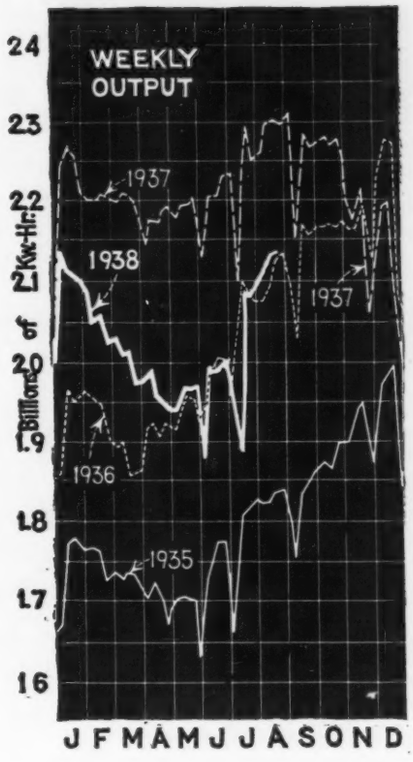
Production of electricity by the electric light and power industry rose slightly for the week ended August 20, attaining 2,138,517,000 kw.-hr., as against 2,133,641,000 kw.-hr. for the previous week of August 13, according to the Edison Electric Institute. Output remains 7.2 per cent under last year's figure of 2,304,032,000 kw.-hr. for the corresponding week, but is somewhat above the figure for the corresponding week of 1936, which was 2,093,928,000 kw.-hr.

Weekly energy production with this figure continues its march toward a new high for the year. It seems probable that only an unexpected change can keep this from being attained within the next few weeks. The existing high for the year of 2,139,582,000 kw.-hr. was reached during the week of January 8. Output is now a mere 1,065,000 kw.-hr. below that record.

Though all regions showed decreases from the corresponding weeks last year, the regional decreases for the New England and Middle Atlantic states were lower than last week.

Weekly Output, Millions Kw.-Hr.

1938	1937	1936
Aug. 20..2,139	Aug. 21..2,304	Aug. 15..2,094
Aug. 13..2,134	Aug. 14..2,301	Aug. 8..2,079
Aug. 6..2,116	Aug. 7..2,262	Aug. 1..2,079
July 30..2,094	July 31..2,256	July 25..2,088
July 23..2,085	July 24..2,259	July 18..2,100
July 16..2,084	July 17..2,298	July 11..2,030



Per Cent Change from Previous Year

Region	Week Ending Aug. 20	Aug. 13	Aug. 6
New England	— 5.3	— 7.6	— 7.7
Middle Atlantic	— 1.0	— 1.6	+ 1.1
Central Industrial	—13.6	—13.6	—13.2
West Central	— 6.0	— 4.3	— 4.3
Southern States	— 4.0	— 4.6	— 6.7
Rocky Mountain	—19.8	—17.2	—14.4
Pacific	— 5.2	— 4.9	— 2.6
United States	— 7.2	— 7.3	— 6.4

Rocky Mountain Body to Start Light Drive

Utility representatives, electrical dealers, salesmen and jobbers of the intermountain area will gather at Yellowstone Park August 29-31 for the annual convention of the Rocky Mountain Electrical League. The meeting will be the take-off for an intensive fall and winter sales and promotional program.

Beginning in September, the league will conduct a light-conditioning program of indefinite duration, with $50,000 to be spent by the various co-operating interests during the first four months of the drive. Public Service Company of Colorado, General Electric, Westinghouse and other large utility, manufacturing and distributing companies will participate in the multi-state program. Every avenue of advertising and publicity will be employed, including newspapers, billboard, radio, direct mail and poster.

The activity will be directed toward sales of lamps, fixtures, wiring, outlets and other facilities for proper and adequate lighting. It is expected that approximately 5,000 club women and members of Parent Teachers' Associations and various social, church and fraternal organizations will be enlisted in the movement. There will also be contests to stimulate interest.

•

Illinois Output Decreases

Total sales of energy to ultimate consumers by eleven large electric utilities in Illinois amounted to 521,889,507 kw.-hr. in July, as compared with 577,894,775 kw.-hr. for the corresponding month of the previous year. This is a 9.7 per cent decrease in sales.

•

Court Sustains Utility

City of Miami, Fla., was forbidden in a recent order by Circuit Judge H. F. Atkinson to use electricity at the Hialeah water plant from other sources than the Florida Power & Light Company. The city recently contracted for a $180,000 Diesel generator to run the waterworks. Judge Atkinson upheld the Florida Power & Light Company's contention that a 1924 contract, to run sixteen years more, gave the utility the sole right to provide electricity for the water pumps, treating and softening plant.

•

Plans Construction of 40,000-Kw. Unit

Plans for immediate construction of a $3,000,000 addition to the Twelfth Street power plant of the Virginia Electric & Power Company in Richmond have been announced by Jack G. Holtzclaw, president. Increased growth of communities served by the company and heavy industrial demands for power caused the directors to decide to increase the power output by the addition of a 40,000-kw. turbo-generator and a new steam boiler at the Twelfth Street power station. About eighteen months will be required to complete the job, which will put the turbine in service during the spring of 1940.

"This new turbine will be the largest generating unit on the company's system," Mr. Holtzclaw said, "and one of the largest in this section. It follows immediately behind the installation of a new steam boiler in Norfolk, which is just now being completed, and new transmission lines into the Reeves Avenue power station in Norfolk to tie in that station more securely with the other generating plants on the system . . . While present requirements of the system do not justify the installation of so large a generating unit, it is expected that the new equipment will serve to take care of the company's growth for some years in the future," he added.

The company is making plans for refunding $37,500,000 of first and refunding mortgage 4 per cent bonds due 1955, the only funded debt of the company.

•

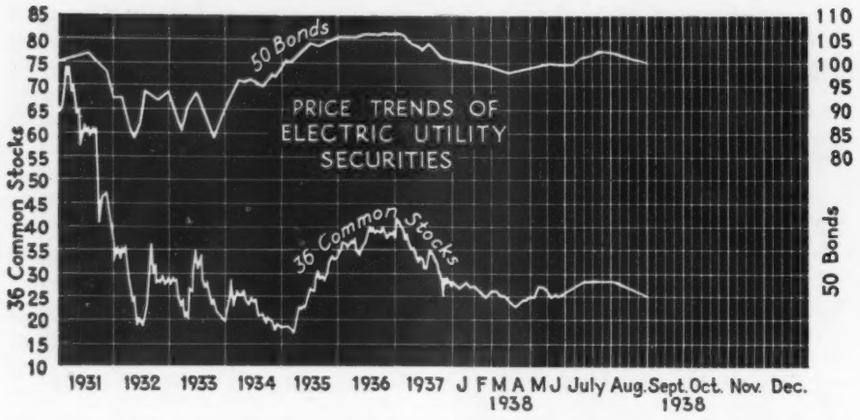
Water Heater Prize Won by Northern States Power

Northern States Power Company, Minneapolis, T. H. Kettle, advertising manager, won first prize in the national advertising contest of the National Electric Water Heating Council. The prize was $250.

Second prize of $100 in the contest went to Tennessee Electric Power Company, Chattanooga, R. W. Youngstead advertising manager.

Third prize of $50 went to Wisconsin Michigan Power Company, Iron Mountain, M. G. Gorrow advertising manager.

Utility Securities Hold Ground


50 Bonds
PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 105 100 95 90 85 80
1931 1932 1933 1934 1935 1936 1937 J F M A M J July Aug. Sept. Oct. Nov. Dec.
1938 1938

Price levels of electric light and power securities hovered around the figures established last week. The "Electrical World" bond index remained unchanged at 102.1. The stock index receded slightly to 27.1 from 27.2 the preceding week; index a year ago 33.4

Stockholders Vote Reorganization Plan

A meeting of the stockholders of the Iowa Southern Utilities Company held recently in Davenport gave a majority vote for a reorganization plan under which cumulative preferred stock would be abolished. Edward L. Shutts, president of the organization, presided at the meeting that voted for a new issue, consisting entirely of common stock, par value to be $15. The issue of 358,799 shares of new common stock is to replace 100,000 shares of the present common stock and 80,102 shares of cumulative preferred stock.

Holders of cumulative preferred shares are to receive new common stock and in addition are to receive dividend arrears certificates, representing the full amount of unpaid dividends totaling $2,439,335, which must be paid before any dividends can be paid on the new stock.

•

New York Commission Takes Action on New Franchises

Applications of the New York State Electric & Gas Corporation for approval of the exercise of new franchises for the furnishing of electricity in various villages and towns in Steuben County have been acted upon by the Public Service Commission. In some cases the petitions to exercise new franchises were granted and in other cases similar petitions were denied.

The commission granted applications for the exercise of new superseding franchises in the villages of South Corning, Riverside and Arkport and denied petitions for exercise of new franchises in the towns of Campbell and Canisteo. The company is now serving electricity in all these municipalities under franchises granted to predecessor corporations and transferred through mergers and other means to the present New York State corporation.

•

Announces Progress in Refunding Plan

Commonwealth Edison Company on October 1 will take another step in its program for retiring and refunding debts of associated companies in order to simplify the capital structures and reduce interest charges.

On that date Public Service Company of Northern Illinois will retire $18,876,000 of its first and refunding mortgage bonds, due in 1956. Funds for redemption will be supplied by Commonwealth Edison. The bonds carry a 5 per cent coupon. Commonwealth recently sold securities at 3½ per cent.

Commonwealth Edison now has a $73,000,000 debt refunding program before the SEC. This includes $33,000,000 of first mortgage bonds and $40,000,000 of debentures.

•

New York & Queens Issues Preferred Stock Warrants

Stockholders of the New York & Queens Electric Light & Power Company have received warrants to subscribe to the 8,772 additional shares of 5 per cent non-cumulative preferred stock, the issuance of which has been approved by the New York Public Service Commission. Consolidated Edison Company, which owns 98.51 per cent of the Queens company common stock, is exercising its rights to subscribe to its pro rata share, or 8,629 shares, bringing its holdings of preferred stock to 95.12 per cent.

Stockholders may subscribe for full shares of the preferred stock at $100 a share, plus accrued dividends, on the basis of one share of preferred for each 50 shares of either preferred or common, or both, held by the stockholder. Rights to subscribe will expire on September 9.

•

Indianapolis Issue Called

Indianapolis Power & Light Company has called for redemption on October 11 all of its outstanding first mortgage gold bonds, series A, 5 per cent, due January 1, 1957, at par and accrued interest to the redemption date, plus a premium of 4 per cent of the principal amount.

•

Declines to Defer Hearing

Holding that no good or sufficient cause for postponement has been shown, the Federal Power Commission in an order recently made public denied the application filed by Edwin M. Sturtevant, attorney, for a postponement of the hearing on the applications of John E. Aldred, Herbert A. Wagner, John A. Walls, Charles M. Cohn and fifteen others for authorizations to hold duplicate positions or directorates. Applicants are directors of the Consolidated Gas, Electric Light & Power Company of Baltimore or affiliated corporations. Hearing will be held on September 1.

•

Utah Power Dividends

Board of directors of the Utah Power & Light Company has declared a dividend of $1.16 2/3 on the 7 per cent preferred stock and a dividend of $1 on the 6 per cent preferred stock, on account of accumulations.

Earnings Reports (Utilities)

	Net Income 1938	1937
*The Detroit Edison and subs...	$7,061,190	$10,883,134
*Pub. Serv. N. J. and subs.....	34,714,264	38,565,879
*The Montana Power and subs..	2,455,181	4,074,459
*Texas Pwr. & Lt.....	2,244,791	2,041,837
*Kansas Gas & Elec.....	1,303,426	1,324,215
‡†Associated G. & E. and subs...	441,662	2,650,309
†Federal Lt. & Trac. and subs..	1,506,758	1,602,442
†Columbia G. & E. and subs....	11,733,586	12,679,293
†N. Y. State E. & G.....	1,990,848	1,684,745
†Pennsylvania Elec. and subs...	1,618,023	1,792,452
†Cincinnati G. & E.....	4,192,607	3,924,652
†The Nevada-California Elec. and subs.....	588,030	739,785

* Twelve months ended July 31.
† Twelve months ended June 30.
‡ On "earning power — annual charge" basis.

Sees 2,300 Volts for Streamliners

The streamline train of the future may operate with 2,300-volt, three-phase current over a single transmission line to serve the 600 kw. needed within the cars of a twelve-car train, C. P. Kahler, chief electrical engineer Union Pacific Railroad, told the American Society of Civil Engineers at its recent annual meeting in Salt Lake City.

Electricity for heat, air conditioning, light, ventilation, water cooling and other apparatus now requires about 50 kw. per car on a modern streamline train, whereas conventional passenger cars have used only from 2 to 4 kw. per car, Mr. Kahler said. Thus a twelve-car train needs 600 kw. in auxiliary power.

Steam trains generally have used d.c. at 32 volts, but on the first streamliner this voltage was increased to 64 volts to cut down the size of cables extending through the train. As the trains have lengthened out and the energy requirements have increased voltage has already been raised to 220, three phase, with the prospect of going to 440 or 550 volts, Mr. Kahler reported, in which event individual car transformers would be used to step down to utilization voltages.

A single power line along the train would materially reduce the complexity of uncoupling the cars, now involving several different circuits. However, Mr. Kahler emphasized the fact that the problem of developing suitable receptacles and plugs remains to be solved.

•

Separate Air Unit Department Formed

The rapid growth of the air-conditioning business plus the future possibilities for this comparatively new industry has caused Westinghouse to reorganize its air-conditioning department, with headquarters for the newly created department located at the company's East Springfield, Mass., plant. This change is effective September 1. P. Y. Danley has been named as manager of the air-conditioning department and S. F. Myers has been appointed assistant manager with headquarters in Chicago.

Mr. Danley, who will be responsible for all commercial and household air-conditioning activities, has appointed H. F. Hildreth to direct the sale of home air-conditioning equipment. Mr. Hildreth will also be located at the East Springfield plant. The new department will function as a separate organization and will not be directly associated with the present merchandising division as it has been in the past.

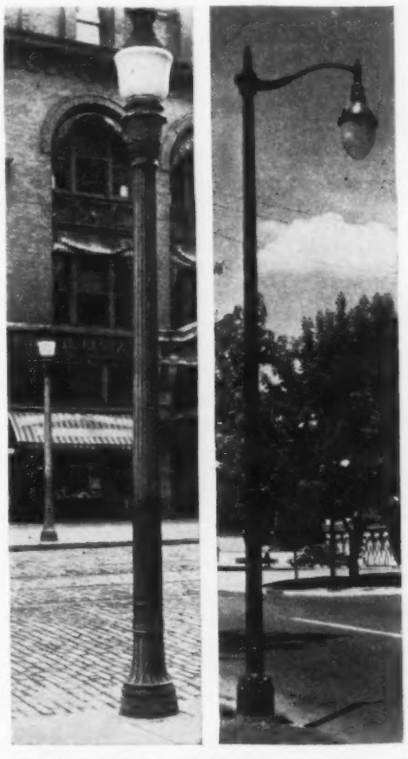
•

New Street Lights for Rochester, N. Y.

In a recent street-lighting installation by Rochester Gas & Electric Company 135 acorn-shaped incandescent luminaires replaced 75 single-arc lamps along East End Avenue, one of the main traffic arteries of Rochester, N. Y.

The new lamps are 600 and 1,000 candle-power, as compared with an approximate rating of 1,250 candle-power for the arc lamps. Whereas the old lamps were spaced 170 feet apart and represented a total of 95,800 candle-power, the new luminaires are staggered about 100 feet apart and total 97,800 candle-power.

Although this increase seems small in figures, the increase in luminosity is much greater, utility officials pointed out, because the new lamps are designed to direct the light downward on the pavement. The new lamps, which overhang the street, have a mounting height of 20 feet, 5 feet higher than the arcs.



NEW STREET LIGHTS—Acorn-shaped incandescent luminaires, of the type shown at right, replaced arc lamps, shown at left, in a recent street-lighting installation by Rochester Gas & Electric Company, providing a 50 per cent increase in efficiency

In making the installation city officials and the utility kept in mind that future traffic increases might call for higher intensity, so that more than double the present light can be furnished without materially changing the system.

Union Metal poles and General Electric luminaires were used. The installation runs from the city line to the business district, twin-arc lamps remaining in the business section.

•

Farm Electrification Shows Standard Rise

Testing the growth of farm electrification, as shown by mass statistics, against a sample of 3,000 farms in selected counties in 40 states, the Bureau of the Census announces that 39 per cent of the dwellings in this group now have electricity. Eight years ago only 23 per cent of all farm dwellings had electricity, according to the Census for 1930. In so far as these 3,000 farms were typical of the country as a whole, the figures indicate a relative increase of 70 per cent.

For farms operated by owners the ratio rises to 51 per cent. Analysis by regions reveals some surprisingly high saturation figures, topped by New England with 74 per cent, followed by the Mountain and Pacific groups with 64 per cent, and the North Central with 43 per cent. The low average of 24 per cent in the South is accounted for by the general lack of electric service on farms of negro operators; more than one-third of the white operators reported electricity.

Availability of electric service is reflected also in other items. Water was piped into 33 per cent of the dwellings, compared with 24 per cent in 1930, and into bathrooms in 23 per cent, against the earlier 15 per cent. Radios increased from 29 per cent to 62 per cent.

Other rising standards of living and of farm operation show up in the increase of automobiles from 64 to 71 per cent, motor trucks from 18 per cent to 24 per cent and tractors from 16 per cent to 33 per cent.

It is pointed out in the report that the figures are based on samples and are to be considered as indicatives, not as exact measures of change.

•

Gulf States Plan Approved

SEC has approved the plan of Gulf States Utilities Company, a subsidiary of the Engineers Public Service Company, to offer 6,209 of $6 preferred shares for the outstanding 6,209 of $6 preferred shares of Baton Rouge Electric Company.

M.I.T. to Test Wind Velocities in Tunnel

Wind velocities of 400 miles per hour—double the speed of a West Indies hurricane—will be whirled through the Massachusetts Institute of Technology's new testing tunnel for aeronautical research by the 2,000-hp., four-speed, 2,300-volt Westinghouse alternating-current motor and 13-ft.-diameter propeller when the installation is completed this fall.

On September 12 the tunnel will be dedicated by Orville Wright and will bear the Wright name in honor of the pioneer achievements of the Wright Brothers in air flight development. The motor was first mounted in a section of the tunnel casing machined at the Westinghouse factory to provide the accurate fit required, then transported to Cambridge. A 40-hp., 2,300-volt auxiliary blower motor is required to cool the main motor, besides small air compressor and oil pump motors.

This equipment will enable the Institute to simulate variations in atmospheric conditions up to theoretical altitudes of 35,000 ft., and under pressures up to four atmospheres, as well as those corresponding to sub-stratosphere flight at high speed. The tunnel is to be about 75 ft. long and the ambient temperature will be about 95 deg. C. The main motor is waterproof, as hydraulic tests will be made prior to operation under air pressure.

•

Gain in G.E. Employee Bonds

On June 30 there were 26,297 employees, former employees and dependents of deceased employees of General Electric Company who owned or had subscribed for G.E. employees 5 per cent bonds having a total value of $28,964,390, as against 21,992 and $25,053,940 a year ago. The additional pension trust, in which more than 51,000 employees participate, held $11,665,000 of the bonds on June 30, as against $9,932,000 a year ago.

•

Power District Held Valid by State Supreme Court

Validity of public utility district No. 2 of Pacific County, South Bend, Wash., was recently upheld by the State Supreme Court, when it ruled sufficient legal notice had been given before the election to vote on formation of the district. A taxpayer attacked formation of the district and election of commissioners on the grounds that the county auditor had failed to post special election notices in each voting precinct. The lower court dismissed the suit and was upheld by the Supreme Court.

The high court held failure to post notices in each precinct, as charged in the taxpayer's suit, was "not fatal to formation of public utility district No. 2" because there had been a substantial compliance with election laws and the public was informed by other means through public meetings and general publicity.

World Power Conference—Vienna sectional meeting, August 25–September 2. Executive committee, U. S. National Committee, World Power Conference, 4 Irving Place, New York, N. Y.

Rocky Mountain Electrical League—Annual meeting, Canyon Hotel and Lodge, Yellowstone Park, Wyo., August 29–31. George Lewis, managing director, Gas and Electric Building, Denver, Colo.

Illuminating Engineering Society—Annual convention, Nicollet Hotel, Minneapolis, Minn., August 29–September 1. A. D. Cameron, general secretary, 51 Madison Avenue, New York, N. Y.

International Association of Electrical Inspectors—Eastern section, Hotel Lord Baltimore, Baltimore, Md., September 6–8, F. N. M. Squires, secretary, 85 John St., New York, N. Y. Southern section, George Washington Hotel, Jacksonville, Fla., September 12–14, Joseph Whitner, secretary, P. O. Box 1743, Atlanta, Ga. Western section, Hollenden Hotel, Cleveland, Ohio, September 19–21, F. H. Moore, secretary, 320 N. Meridian St., Indianapolis, Ind. Northwestern section, Hotel Spokane, Spokane, Wash., October 3–5, F. D. Weber, secretary, P. O. Box 70, Portland, Ore. Southwestern section, Hotel Lafayette, Long Beach, Calif., October 10–12, H. L. Gerber, secretary, 205 City Hall, San Francisco, Calif.

Pennsylvania Electric Association—Annual meeting, Bedford Springs Hotel, Bedford Springs, Pa., September 7–9. Harold A. Buch, secretary-treasurer, Telegraph Building, Harrisburgh, Pa.

Maryland Utilities Association—Fall convention, Ocean City, Md., September 9 and 10. Warren D. Haley, secretary, Takoma Park, Md.

National Electrical Contractors Association—Annual meeting, Book-Cadillac Hotel, Detroit, Mich., September 12–15. L. W. Davis, general manager, 420 Lexington Avenue, New York, N. Y.

International Municipal Signal Association—Annual meeting, Lord Baltimore Hotel, Baltimore, Md., September 12–15. Irvin Shulsinger, secretary, 7 East 42d St., New York, N. Y.

Empire State Gas & Electric Association—Annual convention Lake Placid Club, Lake Placid, New York, September 15-16. George H. Smith, secretary, Grand Central Terminal, New York, N. Y.

Wisconsin Utilities Association—Transportation section, Lawsonia, Green Lake, Wis., September 19–20; accounting section Lawsonia, September 23–24; electric section, commercial and technical divisions, Schroeder Hotel, Milwaukee, Wis., October 24–25. A. F. Herwig, executive secretary, Brumder Bldg., Milwaukee, Wis.

Indiana Electric Association—Annual convention, French Lick, Ind., September 29–October 1. Tom C. Polk, secretary, 607 Traction Terminal Bldg., Indianapolis, Ind.

American Transit Association — Annual meeting, Toronto, Canada, October 3–6, Charles Gordon, managing director, 292 Madison Avenue, New York, N. Y.

National Safety Congress—Silver Jubilee, Stevens Hotel, Chicago, Ill., October 10–14.

Lighting-Telephone System for Japan

As a start of a system for providing telephone service to rural Japanese villages through the medium of low-voltage power lines Japanese engineers will start to install 50 such circuits in scattered parts of the country, reports a recent issue of *Foreign Communication News*, published by the U. S. Bureau of Foreign and Domestic Commerce.

The new system uses a telephone carrier frequency of 20 to 40 kc., so as not to interfere with the 50- or 60-cycle frequency of the power line. Engineers, however, have found it necessary to develop special lightning arresters and circuit breakers to prevent injury in the event the lighting-telephone line is accidentally connected with a high-tension circuit.

Testing so far has indicated a maximum range of 1.2 miles for the new system, according to the report. Under normal circumstances cost of installation for five telephones within a radius of 0.6 mile is 7,700 yen, of which 4,500 yen is for poles and 3,200 for wire. Use of the light wires reduces cost to about 1,500 yen, or about one-sixth. (A yen is about 29 cents, U. S.)

•

American Trade Association Announces Fall Program

Industrial and agricultural problems, employer-employee relations, state and federal legislative trends involving the economic security of the worker, the consumer and the producer will be discussed at the nineteenth annual meeting of the American Trade Executives, which will be held in the William Penn Hotel, Pittsburgh, September 22-24.

William J. Donald, managing director National Electrical Manufacturers Association, will lead a round-table discussion on "Standardization and Simplification of Industry Products," and John W. Hill, assistant to the president, American Iron and Steel Institute, New York City, will lead one on "Explaining Industry to the Public."

•

Adds New Trolley Coaches

Boston Elevated Railway will add 28 more trolley coaches to its present rubber-tired fleet of 64 vehicles in the late fall. Pullman Standard Car Manufacturing Company is building the new coaches, eighteen of which are to be electrically equipped by General Electric Company. The new equipment will cost approximately $300,000.

FOR AS LITTLE AS

$27 YOU CAN START A TESTING SET

ONE AP-9 voltmeter, net price only $27, can form the basis for your testing set. With this single instrument you can begin to capitalize the many ways in which instruments may point the way to savings. It's a simple, inexpensive way to turn power losses into power savings.

The AP-9 is a handy instrument. Compact, like a modern camera, it's easy for the service man to carry and use. It's built to stand up under hard usage. The accuracy is ¾ of one per cent of full-scale value—high enough for almost every commercial testing job. You'll find many uses for the AP-9 voltmeter in your plant.

Later, when you have begun to realize the savings these instruments make possible, you can increase your testing facilities with others from the AP-9 line—ammeters, milliammeters, and wattmeters. Start your testing set now. Call the nearest G-E sales office today. General Electric, Schenectady, New York.

GENERAL ELECTRIC

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

Filing No. 6200 430-100

Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

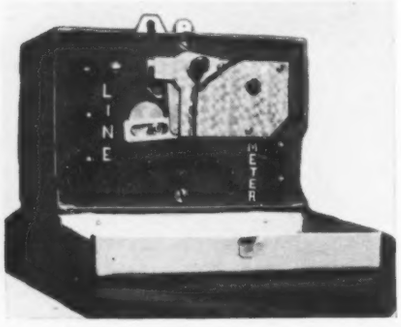
Use Only One Meter in Voltage Analysis

By R. C. JONES
Superintendent Meter Department, Nevada California Electric Corporation, Denver, Colo.

Where two recording voltmeters were formerly required to make a simultaneous voltage analysis on both sides of neutral in 115/230-volt, three-wire services, the test is now made with one. The meter department of the Nevada-California Electric Corporation has designed and built an electrically driven throw-over switch which alternately connects a single recording instrument to two sides of a three-wire service. It can also be used to read a three-phase circuit.

Simple in construction, the switch embodies a 2-watt Telechron motor, which is used to drive a disk-plate crank through a 15 to 1 gear reduction. The arm to which this gives an oscillating motion has a toggle member riding on its opposite end. This end is heart-shaped, providing minimum dead center and quick travel for the flexible arm which carries the contact. This flexible arm is always under tension. It travels rapidly, transferring contact in about 2 cycles.

The period during which the meter remains on one side of the line may be adjusted from two to 30 minutes, but fifteen-minute intervals yield the best results.



Electrically driven switch used for alternating connections of the recording voltmeter on 115/230-volt service voltage analysis

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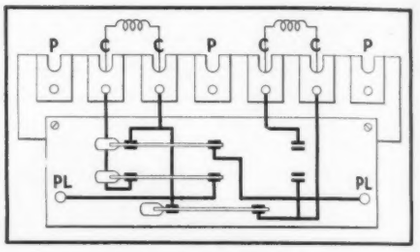
Meter Testing Time Saver

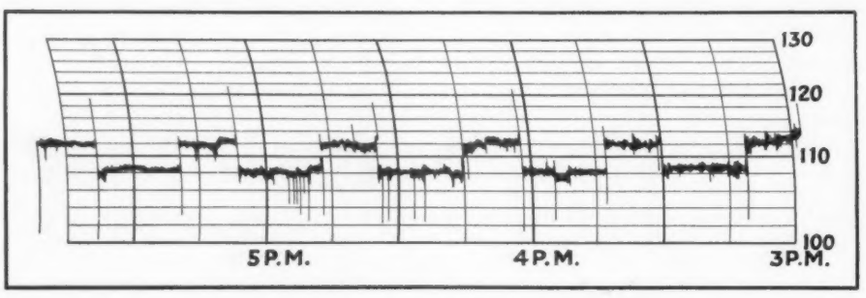
By S. B. SPRACKLIN
Meter Department, Empire District Electric Company, Joplin, Mo.

Considerable time is saved in making field tests with artificial load on transformer type three-phase meters of the Empire District Electric Company system by the use of the simple connection changer shown. Each meter installation includes a States test block on which the test connections are made by means of a flat terminal board from which the leads run to the phantom load and to the rotating standard. To the lead terminal board a small switch panel has been added, as appears in the diagram. The artificial load check is made on each meter element singly and with the two-in series current coil connection.



Makes quick meter connection changes

Load connections are made to the terminals *PL*. With the two single-pole, double-throw switches in the position shown only one current coil of the meter is connected; the other is connected by throwing both switches to the opposite side. Series connection of the two current coils is accomplished by closing one double-throw switch to the right and the other to the left, the single-throw switch remaining closed. When reverse current in the two elements is desired for checking torque balance, the single-throw and one double-throw switch are opened and the other is closed in either direction and two clip jumpers are used. One jumper connects the end clips of the open double-throw switch and the other runs from the center point of this switch to the open clip of the other double-throw.



Voltage record taken with the switch operating

Outdoors, too,

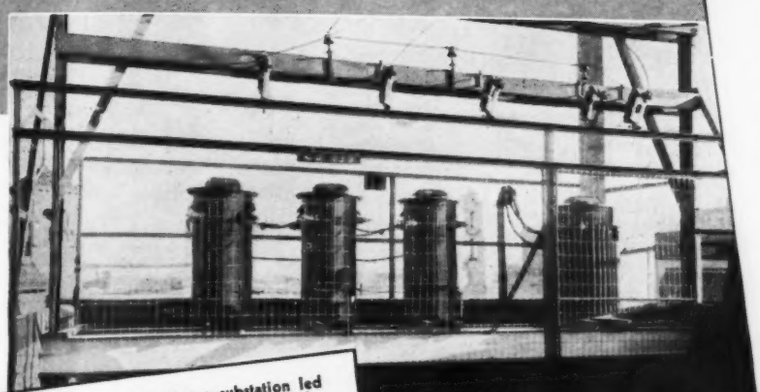
G-E PYRANOL TRANSFORMERS

Bring Savings and Safety

As with all other good things, time and experience have proved the advantages of Pyranol transformers in continually widening fields of application.

For example, many installations now being made for outdoor service, with advantages comparable to the many successful indoor installations, are realizing either savings in installed cost or extra safety, because of the noninflammable and nonexplosive character of Pyranol.

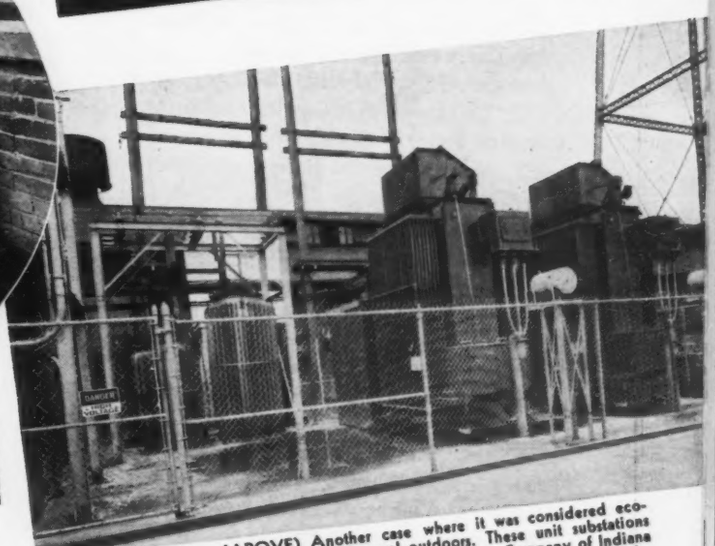
Consider the advantages of Pyranol transformers for *all* your installations. Frequently, lower installation costs or the additional safety of Pyranol units will give you extra profit. General Electric Company, Schenectady, New York.



The problem of relocating a substation led to the selection of Pyranol transformers for this roof-top substation of the Kansas City Power & Light Company. The alternative was to build a vault indoors. The Underwriters would not approve the use of oil-filled transformers on the roof, but they did approve the Pyranol installation. The result: reduced installation costs, plus savings of valuable floor space inside the building.

(ABOVE) Safety was the first consideration in this installation. Because the transformer was to be located outside a building in which explosive chemicals are used, the United States Rubber Products Company selected a Pyranol transformer—nonexplosive and noninflammable.

(LEFT) This installation of Pyranol transformers pays a dividend of 20 per cent on the added investment involved. Had oil-filled transformers been installed, a brick wall would have been necessary between the transformers and an adjacent wooden building. Other precautions, including wire glass in all facing windows and a water curtain, would have been necessary. Immediate savings of $2,000 in costs of installing were effected, plus an estimated $200 a year in reduced maintenance costs.



(ABOVE) Another case where it was considered economical to use Pyranol outdoors. These unit substations were installed by the Public Service Company of Indiana at the plant of the Chrysler Corporation in New Castle.

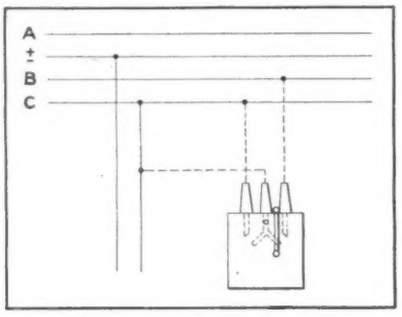
GENERAL ELECTRIC

300-68

Use Portable Breaker in Transferring Load

By R. A. KOPPANA
Milwaukee Electric Railway & Light Company, Milwaukee, Wis.

In order to maintain good voltage regulation on a feeder it is necessary to hold a close balance in load on the three phases. Due to larger increases in load in one area than in another, it becomes necessary occasionally to transfer load from one



Use portable breaker for transferring load

phase to another to maintain this balance. Improvements have been made in most operations in the electric utility field with particular emphasis on safety and length of line outage. However, transferring of load on overhead primary lines remains an old art within the realm of modern methods.

One method of transferring load from one phase to another on overhead lines is to use an oil circuit breaker. The most suitable one available was a 5,000-volt, 60-amp. double-throw, double-pole, indoor oil circuit breaker. It has an interrupting capacity of 250 amp. and a one-second capacity of 3,200 amp. The breaker was changed to single-pole type by interconnection of blades, which also increased the interrupting capacity. The blades were shortened so that there would be a neutral position when shifting the movable blade from one phase to another. The back of the breaker frame is equipped with crossarm hangers. Weight of breaker with oil and leads is approximately 50 lb.

With the breaker on an arm, it is easy for the lineman to connect the three leads to their proper positions. The middle lead is connected to the phase wire of the branch line, one outside lead is connected to the same phase of the feeder, the switch is closed between these two and the phase tap of the branch line is opened, thus diverting the load through the breaker. The lead from the open side of the breaker is now connected to the feeder conductor to which the load is to be transferred. By a quick operation of the breaker the load is transferred without an arc and with only a split second outage. After this has been done the permanent jumpers are installed and the breaker is removed. A portable breaker of this type has been used for nearly a year by the line crews of the Milwaukee Electric Railway & Light Company and found to be very satisfactory.

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Portable Lamp for Shop and Plant

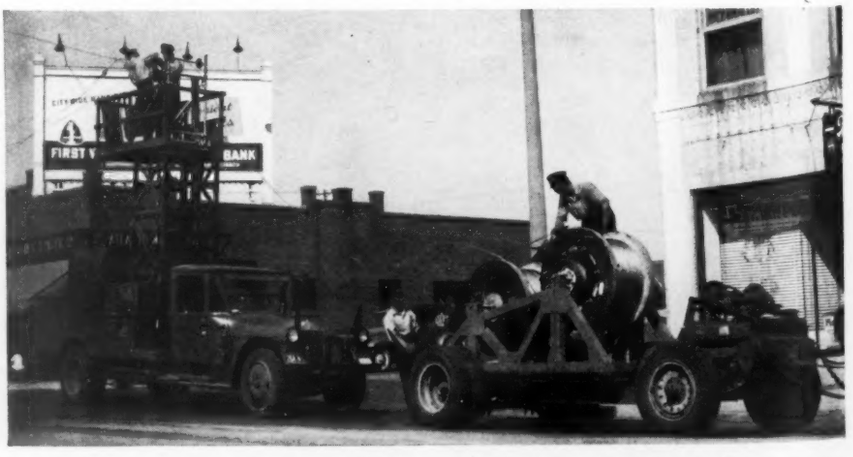
By PAUL F. RATCLIFF
Lacombe Station, Public Service Company of Colorado, Denver

Occasions frequently arise during maintenance repair jobs when it is next to impossible to hang a trouble light in a location where one can get the proper illumination on the work. The accompanying illustration shows a lamp made up for use around a power plant. Since it was made this lamp has been used on almost every repair job in the plant or shop. The three-leg stand was made of ½-in. iron rod, welded to a stem of ¾-in. conduit, leaving enough conduit below the weld for a bushing.

The lamp is approximately 5 ft. 10 in. high and the reflector used is an elliptical 200-watt solid base, on which the crimp was loosened just enough to allow the shade to turn, leaving the socket rigid. This arrangement permits the light to be directed up or down, giving a wider range than would be possible with a fixed reflector. Two ⅜-in. iron rod hangers were welded to the conduit, making a cord reel. An outlet for electric drill, hammer or extension cord can be made by cutting in a type FSC condulet just above the leg weld. This adds much to the usefulness of the lamp and does away with extra extensions, double sockets and connected troubles. The lamp is easy to make and the total cost so inconsiderable that the expense involved is saved many times over in a comparatively short time.

Handy home-made lamp for maintenance and repair work

WIRE-STRINGING TRAILER



It is no longer necessary to string trolley wire at night time, using the old flat car on car tracks. The Milwaukee Electric Railway & Light Company has perfected a two-reel stringing rack mounted on a rubber-tired trailer. With a truck towing this trailer, and a truck following, trolley wire can be strung in the daytime under traffic, without interruption to service. The stringing rack is equipped with brakes, permitting wire to be strung under any tension. While the particular use of this trailer is for stringing trolley wires, it could readily be used, with possibly some slight modifications, for transmission line construction also.

Malleable Poles Stand 3-Ton Load

Second only to the attainment of suitable strength and durability, appearance is becoming a factor of increasing importance on most public works improvements. As a source material for such accessories as trolley and light poles, malleable iron possesses qualities for both sound and appealing construction. Malleable iron light poles on the recently completed Pittsburgh - Homestead High-Level Bridge provide an example of interesting design combined with high strength. A test to destruction conducted on trolley poles for this bridge before their installation demonstrates the actual strength of the assembled poles.

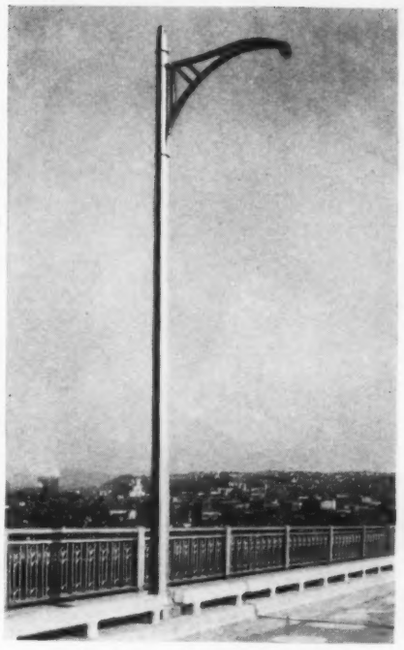
These poles were made in five hollow segments, octagonal in cross-section. Length of the segments ranged from 4 to 4¾ ft., and the diameter across the flats tapered from 9⅞ to 5½ in. Pieces were cast so that the bottom end of one section slipped snugly into the top end of the next section with a lap of about 5 in. The joint voids are filled in with nonferrous low melting point metal, while the surface seams are filled with weld metal. The eight surfaces are then ground and painted.

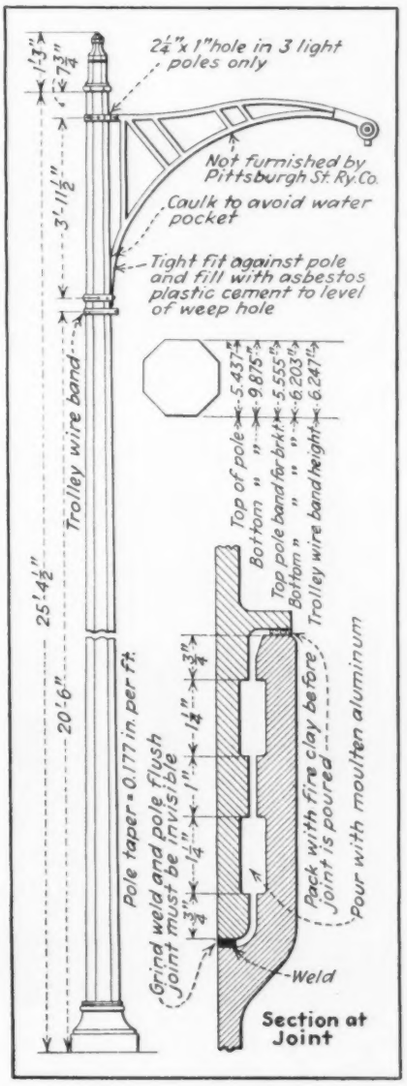
The pole under test, 25 ft. 4 in. long, was supported on two 15-in. I-beams properly anchored. Four 1½-in. bits through the base of the pole extended to the bottom of the I-beams through a 1½-in. plate which spanned the bottom of the beams. Load was applied perpendicular to the pole 18½ ft. from the I-beam floor by a cable attached to a clamp on the pole. The cable passed over a pulley at an adjacent crane support and down to a bucket into which pig iron could be placed as a dead weight to apply the load. Deflection of the poles was obtained by a plumb-bob supported from the pole clamp. The bucket, a furnace feed bucket, weighed 1,400 lb. with its supporting chain. For additional load, the exact weight of pigs of iron was obtained and these were placed in the bucket and deflection reading taken for about every 400-lb. increase in weight. Results obtained are shown in the accompanying tabulation.

Failure which took place before the last deflection reading could be taken occurred under a load of 5,964 lb. The break occurred in the second section of the pole where its size was reduced to enter the bottom section, or at a point 4 ft. above the base.

Load and Deflection Data
Malleable Iron Light Pole

Test	Deflection, In.	Load, Lb.
1	3¼	1,400
2	4	1,823
3	5	2,246
4	6¼	2,704
5	7½	3,149
6	8¾	3,564
7	10¼	4,014
8	11½	4,415
9	13½	4,856
10	16	5,298
11	18¾	5,756
12	—	5,964




2¼"x 1"hole in 3 light poles only
Not furnished by Pittsburgh St. Ry. Co.
Caulk to avoid water pocket
Tight fit against pole and fill with asbestos plastic cement to level of weep hole
Top of pole
Bottom " "
Top pole band for brkt.
Bottom " " "
Trolley wire band height
Trolley wire band
Pole taper = 0.177 in. per ft.
Grind weld and pole flush Joint must be invisible
Pack with fire clay before Joint is poured
Pour with moulten aluminum
Weld
Section at Joint

Malleable iron light poles for Pittsburgh High-Level Bridge stand 3-ton load—deflect 19 in.

•

Capacitors Forestall $6,500 Investment

Capacitor installations on feeders serving the downtown area of Warren, Ohio, has solved the problem of how to handle power consumption increase for the Ohio Public Service Company. The complete program calls for the installation of 1,800 kva. of capacitors within four years; 360 kva. of these units, supplied by General Electric, have already been put in, effecting an initial saving of $6,500 on forestalled substation investment.

Study revealed that the location and physical layout of the existing substation would not permit the addition of new capacity. To expand facilities would have required building a new substation far on the other side of town—the only place where a suitable site was obtainable.

Further analysis disclosed that an installation of 420 kva. of capacitors at a cost of approximately $4,000 would release 230 kva. of the present substation capacity, permitting profitable handling of the anticipated load growth for one year.

By extending the program over a four-year period until a total of approximately 1,800 kva. of capacitors have been installed, estimated yearly load increases on the substation will be relieved, according to the program analysis.

The survey showed that the following annual savings might be claimed in addition to the $6,500 saving on forestalled substation investment.

Value of released generating capacity	$23,600
Value of released feeder capacity	5,100
Increased revenue	3,500
Savings in distribution feeder copper losses	3,000

YOUR CHOICE of EIGHT CONDUCTOR SIZES

with

COPPERWELD -

ANACONDA WIRE AND CABLE CO. — COPPERWELD STEEL C

With Copperweld-Copper Conductors you have *all the sizes needed* for rural lines. From the large main line sizes all the way down to No. 11 Copper equivalent for branches and taps you can choose the conductor size that's most economical and efficient.

All eight conductor sizes listed have the same rugged, vibration reducing three-wire design. All are tied to the insulators with simple annealed tie wires; one piece of wire to an insulator. All are strung and spliced like Copper Conductors. And all are sold by the companies listed below.

Use Copperweld-Copper Conductors for rural lines—and choose the size best suited to the job.

COPPER CONDUCTORS

MANUFACTURED AND SOLD BY

— KENNECOTT WIRE AND CABLE CO. — PHELPS DODGE COPPER PRODUCTS CORP.

Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers

Protect Transformers by Water Spraying

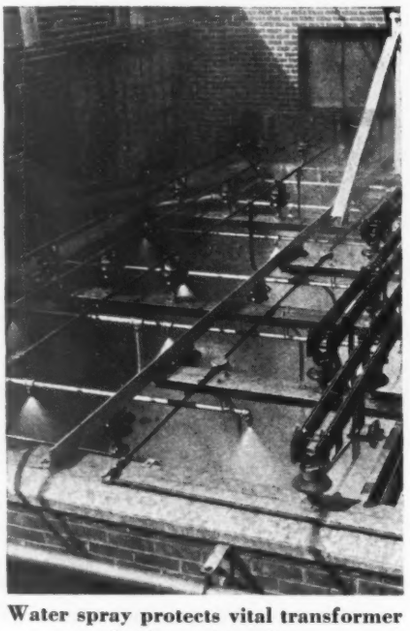
By J. V. RUSSELL
Engineer-Inspector Associated Factory Mutual Fire Insurance Companies, Philadelphia

Well planned protection against interruption of plant operations by fire is illustrated at the Scott Paper Company, Chester, Pa., where blank brick subdividing walls and a water-spray fire-protective system have recently been provided at the transformer installation. The plant operates almost continuously and maintenance of an uninterrupted power supply is vital.

Part of the electrical energy is generated at 575 volts on the premises and the remainder is purchased from the Philadelphia Electric Company, with supply through two independent underground lines to two banks of three 1,000-kva., 13.200/575-volt oil-filled transformers. Either primary line may supply one or both banks; the secondaries are connected to one busbar system and the mill generators to another, with two busbar systems interconnected through an oil switch.

The full capacity of one bank of transformers is needed to supplement the mill-generated power, and occasionally both banks are needed to supply the maximum demand. Energy for lighting is obtained through two banks of three 75-kva. transformers, which reduce the voltage from 575 to 110.

Crowded yard conditions made it necessary to locate the twelve transformers in a courtyard near buildings which would be exposed to a transformer fire, which might result in a shutdown. To minimize such a possibility improvements were made, in line with suggestions by the Associated Factory Mutual Fire Insurance Companies. Each power bank and the lighting transformers were separated by blank brick walls extending up above the units; concrete curbs and fire doors were provided at entrances, and the enclosures were drained through 6-in. trapped pipes



Water spray protects vital transformer bank against fire

discharging into a near-by river. To confine fire damage to the unit in which the fire originates, a Grinnell automatic Mulsifyre system of spray nozzles was also installed over each transformer bank.

The Mulsifyre system consists of an arrangement of specially designed spray nozzles spaced 3 ft. to 4 ft. 6 in. apart, located several feet above the transformers and supplied with water through a permanently piped system from an automatic pressure-controlled centrifugal pump. There is an independent system of 23 heads for each bank of power transformers and a six-head system for the lighting transformers. Each system is ordinarily dry and with the water controlled by a flooding valve operated by thermostats located over the transformers.

Each thermostat is essentially a switch held closed by a Quartzoid bulb which ruptures and opens the switch at a temperature of 175 deg. F. The opening of the circuit opens a small solenoid valve, which reduces the pressure in one of the chambers in the flooding valve, destroying the pressure differential and causing the valve to trip and feed directly from the pump to the system. The Mulsifyre head requires a nozzle pressure of at least 40 lb. at the nozzle for transformer oil fires and discharges about 15 gal. per minute. The water is discharged as a spray which is essentially a non-conductor and similar to a heavy rain.

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Are Your Controls Located Correctly?

By K. B. HUMPHREY
Sayreville, N. J.

In a great many plants, especially where there are medium or small motor installations, little attention has been given to the proper selection of control locations. Inefficiency and inconvenience result. Frequently a few simple changes will make a world of difference in the convenience of such installations. The following six rules will serve as a guide to correcting the more common faults and lead to better starter locations:

A New Non-Metallic Rubber Jacketed Underground Cable

The new Simplex Non-Metallic Rubber Jacketed Underground Cable has just four elements —

Conductor.
Low water absorption rubber insulation.
Reenforcing rubber filled tape.
Hard service rubber jacket.

There are no metallic coverings to cause electrolysis, sheath currents or corrosion.

The insulation over the conductor is Simplex-ANHYDREX deproteinized rubber, the only rubber insulation that will not absorb harmful quantities of water after prolonged submersion. The jacket on this new cable is a 60% rubber hard service jacket.

In addition, this cable can be laid **directly in moist ground or in conduits.** If it is installed in conduits no messy grease or other lubricant is necessary. Simply wet the cable with water and pull the cable in. There are no outer fabric coverings, tars, pitches, etc., to deteriorate in acid or alkaline waters and clog ducts or become "frozen in."

We will be glad to send you a new booklet on this cable upon request. The booklet will show you many advantages and money saving features of this cable that you will want to know about.

Simplex Wire & Cable Co., 79 Sidney St., Cambridge, Mass.

Simplex-ANHYDREX AA

deproteinized rubber insulation for wires and cables

1. Follow the letter of the National Electrical Code.
2. Locate handle or push button at a convenient height.
3. Locate starter, when used, so that operator may stand to one side in the clear, away from breaking belts, etc.
4. Place starter so that the motor and driven machine will be in sight when the operator is starting.
5. See that the operator has secure footing.
6. Use an insulating platform when necessary.

A motor control station should first be studied to see that the code has been followed. While not many violations are found, there may be minor and sometimes a flagrant disregard of rules. In cases of flagrant violations it is often best simply to tear out the old installation and make a fresh start.

Even when the code requirements are fulfilled the starter handle or control button can be and often is located at an inconvenient height or at an inaccessible position. The operator should not be made to stoop to reach it, nor should he have to reach over, through or around a machine.

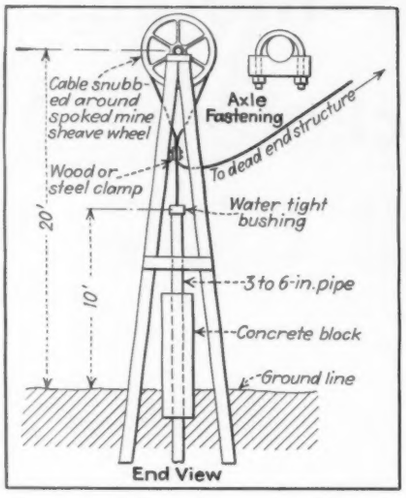
Starting box should be located so that the operator does not have to stand directly in front of it. This is especially true where 2,300-volt compensators are used. If a flash should occur the operator would be directly in line and a bad burn might result.

It is very necessary in many cases to have the control button or starting box in a position where the operator can see what is going on. This is extremely important where inching must be done. Sometimes the control is placed so that an extra man has to shout his instructions to the man at the operating handle.

Even with the starting handle at the correct height the starter may by chance be located where the operator does not have sure footing or he may be off balance. A sudden step backward might cause an injury. In other cases the starting box may be located too close to a stairway. Many installations can be improved greatly by shifting the starter only a short distance one way or another.

An insulating mat or a wooden platform should be provided for the operator to stand on. A rubber mat is probably preferable as it causes no unevenness in the floor line and can be fastened in the correct position. A wooden platform, on the other hand, raised an inch or two above the floor, is plainly distinguished and the operator will stand on it with no tendency to use only one foot on the platform. A wooden platform should not be made too small and cleats should be placed near the edge so that it will not tip should the operator step near the edge. No nails should come through.

SUPPORT FOR MINE POWER CABLE

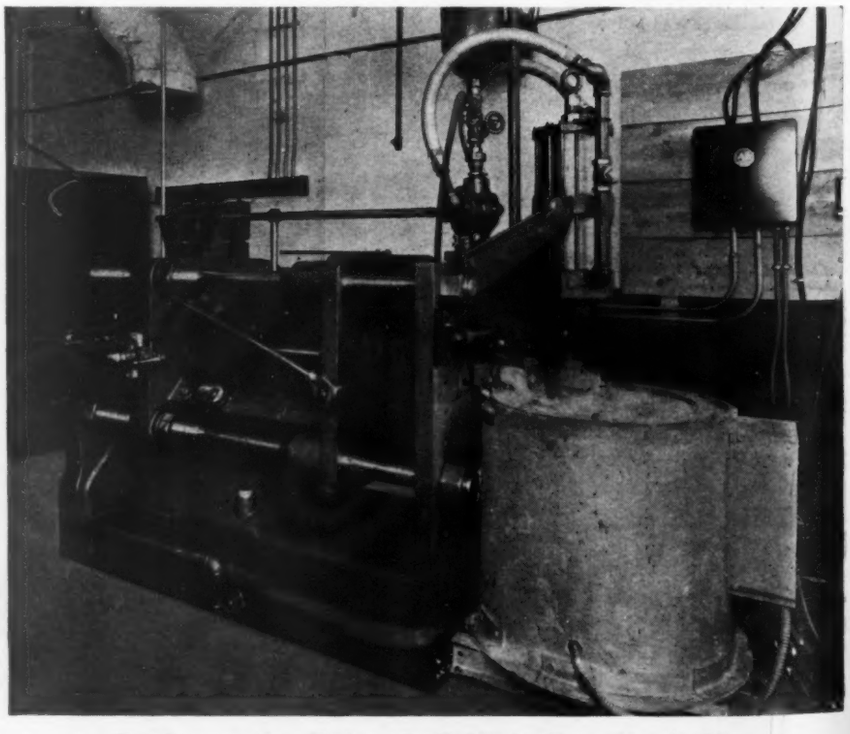


Simple method used to support vertically d.c. feeder cables in a borehole to supply 300-volt direct-current power to the underground workings in coal mines in the Scranton, Pa., area. The method illustrated has been successfully used by the Penn Anthracite Coal Mining Company. An alternate method of supporting suspended cables is described in ELECTRICAL WORLD, March 12, 1938, page 102.

Induction Melting Die-Casting Machine

Combination of an induction melting furnace with a die-casting machine has been worked out in a development installation at the Detroit plant of the Michigan Die Casting Company. Although designed particularly for use with the die caster, the furnace may also be used as an independent melting unit for zinc and zinc base alloys.

The furnace, a Detroit Electric Furnace Company development, is equipped with controls for automatic regulation of power input and of metal temperature. This, it is said, assures a uniform melt of high quality at the desired temperature and with a minimum oxidation of the metal. The furnace is insulated so that working conditions are improved by reduction of temperature of surrounding air. Nominal holding capacities of the new furnace are from 700 to 2,500 lb. of metal and melting speeds are 500 to 800 lb. per hour, depending on production requirements. The furnace is operated on 230-volt, single-phase supply and has a maximum rating of 75 kva.



Development installation of all-electric die-casting machine

ADEQUATE WIRING SERVES AND SAVES

From

FOUNDATION *to* FLAGPOLE

...*But* WIRE IS ONLY AS GOOD AS ITS INSULATION

UNITED STATES RUBBER COMPANY · US · TRADE MARK

United States Rubber Company

United States Rubber Products, Inc., 1790 Broadway, New York, N. Y.

MANUFACTURERS OF ELECTRICAL WIRES AND CABLES

LINEMEN'S BLANKETS · SPLICING COMPOUND · TAPE · SWITCHBOARD MATTING

Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to commercial and domestic customers

Cedar Rapids Gain 12 Kw.-Hr. per Month

By E. G. NICHOLS
Iowa Electric Light & Power Company, Cedar Rapids

OUR COMPANY has been conducting a residence lighting activity in Cedar Rapids, Iowa, through the use of a group of lighting advisers since October, 1934. During the part of 1934 after the activity started and through 1935 there was an average of five girls working on this activity, nine girls during 1936 and seven girls during 1937.

Over this entire period these advisers made "first calls" in 11,486 homes, plus "callbacks" in more than 6,000 homes, showing a wattage increase for the entire period of 1,540,344.

An analysis was made recently to try to evaluate this added wattage into terms of added kilowatt-hours monthly and thence into the average daily hours' use of the added wattage.

For this purpose a group of customers were picked at random from various sections of the city in order to secure a cross-section of family types and their monthly kilowatt-hour use was analyzed for a full year before the advisers' call and for a full year after the advisers' call.

Wherever the records indicated a kilowatt-hour increase out of proportion to what could be reasonably accounted for by the increased wattage, it was eliminated from the calculation on the theory that some other large current-consuming device had been added in the meantime.

When this was completed there remained 333 customers in the total group, some of which, however, showed decreases in consumption instead of increases. A personal call was made on each of those showing a decrease to find out, if possible, the cause. The information obtained from these calls indicated that the use of the added wattage may or may not have contributed to the decrease in kilowatt-hours, so it was decided to include these decreases as a subtraction from the added increases.

The results of the analysis were as follows:

No major appliances that we know of. Includes decreases in kilowatt-hours.

Meter Book No.	Added wattage	Increase Kw.-Hr.	No. Mos.	No. Cust.	Hours Use
3.....	12,230	6,238	418	38	1.55
11.....	10,170	5,948	704	64	1.78
12.....	6,595	4,961	350	35	2.5
20.....	20,225	8,855	694	62	1.3
17.....	11,040	8,479	510	57	2.6
9.....	6,575	2,217	264	27	1.1
7.....	5,300	2,178	195	20	1.4
37.....	4,860	3,665	349	30	2.1
	76,995	42,541	3,484	333	1.75

Kilowatt-hour increase per month — 12.2

•

Philadelphia Efforts Balanced and Planned

Highly satisfactory results of a carefully planned, balanced effort program focused upon 117,381 commercial customers and 1,902 industrial customers are related in the Philadelphia Electric Company's entry for the Augustus D. Curtis Award.

For the twelve months ended March 1, 1938, assistance given by the company's two architectural contact men in the layout of proper lighting and adequate wiring resulted in 174 building projects, which when completed will provide 6,014 kw. of load and E.A.R. of $134,407.

Due to the combined efforts of the company's lighting service section and the two promotional sections the resulting recommendations were responsible for the installation of 14,636 kw. of new lighting load on 5,848 jobs, using 19,626,756 kw.-hr. per year and with an E.A.R. of $509,380. These figures apply only to that portion of the company's achievements embraced by the terms of the award.

In passing it may be noted that these same groups at the same time obtained the installation of 4,330 kw. of industrial lighting with an E.A.R. of $102,715.

The low use problem

In common with most utilities, Philadelphia Electric serves a large proportion of customers who do not pay enough in service bills to meet the costs of rendering electric service to the same customers. When it was found that 42 per cent of the commercial customers were in this unprofitable class, further studies showed that 23,500 of the 36,000 required 75 kw.-hr. per month or less additional usage per month to bring them up to the point where they begin to pay their own way.

Complete co-operative plans have been formulated and for the first two months the plan has been in operation the company's new augmented special sales group has already secured from about 900 customers added usage of 729,326 kw.-hr. per annum, with an E.A.R. of $23,322.

To illustrate the effectiveness of the program to date, it is pointed out that comparisons with the same months of a year ago show an increase in E.A.R. of 21.7 per cent, in

usage of 53.4 per cent, in kw. load of 48.5 per cent—all from 634 more customers.

Four campaigns conducted on commercial lighting since March 1, 1937, yielded the following highly laudable results:

Campaign	No. of Jobs	Load in Kw.	E.A.R. in $
Store and Outdoor			
Indoor	264	377	20,804
Flood	88	104	6,468
Outdoor	41	87	5,001
Sub-total	393	568	32,273
School	9	79	2,146
Commercial farm and lighting	39	14	324
Commercial and industrial lighting			
Commercial	777	3,968	126,336
Industrial	54	1,784	37,220

•

Detroit Sells 60,000 Portable Cookers

By E. W. HACKER
Detroit Edison Company, Detroit, Mich.*

When the Detroit Edison Company decided to feature the portable cooker it was felt that the name cooker was inadequate and that some term more descriptive of this particular appliance should be used. The term "Dutch Oven Susan" was coined, and from then on was used extensively. At the time we began to sell the cooker there were available only two sizes: a 6-qt. non-automatic model termed "Dutch Oven Susan" and a 2-qt. casserole which was called "Little Sister Susan." In all of our newspaper copy as well as customer pass-out literature these terms, "Dutch Oven Susan" and "Little Sister Susan," were used exclusively.

Our first step toward cooker demonstrations was to engage club groups and at their regular monthly meeting prepare for them their luncheons, consisting of baked ham, escalloped potatoes and cornflake pudding dessert. Rolls and coffee were provided by each club group and entire responsibility of serving the luncheon assumed by them. Immediately before the luncheon was served a short talk was given on the advantages and uses of the cooker. At this time additional types of food that were just as easily prepared were shown. This consisted of a complete meal in one cooker, a two-layer cake in another, biscuits or cookies, and some type of broiling.

For demonstrations held on our store floors, three cookers were in operation showing meat roasting, a complete meal, and pastries. Our main concern in floor demonstrations was to display food attractively enough to get customers to stop at the table and give the demonstrator an opportunity to discuss the cooker with them. We were most particular that the table, at all times, be attractively set with something unusual.

At the larger public cooking schools held in the smaller communities we aimed to prepare the ordinary food used every day in the home. In these smaller communities we also used the ten-day free trial offer with excellent results. It was felt that these customers would not be reached by our newspaper advertising, so a letter was mailed to them offering a cooker for ten days. A return card was enclosed in the letter enabling the customer to accept this offer. What few returns we had were mostly by persons desiring a larger type cooker.

Our first activity with the cooker began in the fall of 1933. A total of 60,700 cookers was sold for the five-year period. In the first year, or 1933, about 90 per cent of the total sales in the area were made by the company. In 1934 about 70 per cent were made by the company and the history since then has been an increase in total sales each year, with a corresponding decrease in the percentage of sales made by the company. This shows conclusively that the department store, hardware and electrical dealers have been increasing their sales yearly.

We have found it difficult to get an accurate estimate of revenue. Some consider 200 kw.-hr. per year about right; perhaps this is a little too high; but let's be conservative and say 100 kw.-hr., or half this amount. At an average of 3.5 cents per kilowatt-hour the return would be $3.50 per year. We believe there is a definite place for activity on cookers as well as on ranges. The sale of cookers, in our opinion, in no way affects the sale of ranges. Further, we do not make any effort to use the cooker as an introduction to electric cookery.

•

Light Draws Buyers to "Fashion Center"

In Chicago the corner of 63d and Halsted Streets is a busy shopping area. In the next block south, on Halsted, is Friend's "Fashion Center," a group of ten stores, to which at night the eyes of shoppers are drawn and their feet turned by the attraction of light generously and skillfully employed. The ten stores are in a new building, completely air conditioned, and the total electrical load is 370 kw. This group of stores afforded an excellent opportunity to test the drawing power of light and, according to the owner, the test is successful.

Each store in the group has individuality, to which varied uses of lighting largely contribute. Window lighting intensity ranges from 125 to 500 ft.-candles and the range inside the stores is from 12 to 45 ft.-candles. A new type flush ceiling fixture with light control rings is standard general lighting in all the stores. This is supplemented in each store by large use of auxiliary lighting-niches, coves, glass panels, luminous elements and the like, employing a wide diversity of one- two- and three-filament lamps, lumiline and vari-colored gaseous tubes.

Customers attracted by light

Efficient exterior lighting, signs, windows and street lights help to attract customers to these stores and make this one of Chicago's brightest neighborhood shopping centers.

* From paper to Michigan Electric Light Association.

New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

Test Load Design Is Simple and Flexible

By W. T. ALLEN
Square D Company, Detroit, Mich.

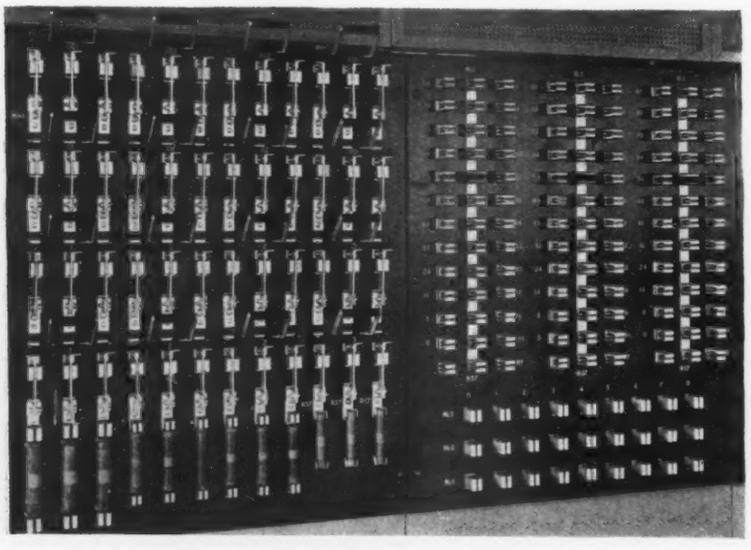
Compactness and flexibility have been designed into the newly constructed test load used in the laboratory of the Square D Company for endurance and overload testing of switch and circuit breaker products.

The assembly consists of air-cooled tapped resistors, parallel with water-cooled resistors for higher current values, in series with tapped air core reactors in a Y connection as in the accompanying diagram. The air core reactors may be shunted with high resistances absorbing 1 per cent of the circuit loss to simulate the characteristics of iron core reactance loads such as motors. Switches permit resistance values from 0.001 to 9.11 ohms to be quickly obtained on the bank of air-cooled resistors. Shunting in the half or full values of the water-cooled resistors allows even higher current flows. Three-pole switches are used so that the three load legs are switched simultaneously. Each reactor consists of 184 turns, tapped in 23 sections of eight turns each. The top 22 sections are handled as units. The bottom section is tapped at each turn. This arrangement is equivalent to tapping each of the 184 turns of the reactor and it allows up to 15 ohms to be obtained in 0.02-ohm steps. The shunt resistors around the reactors are controlled with rotary tap switches giving from one to 4,000 ohms in one-ohm steps.

Equation Yields Kva. for Resonance

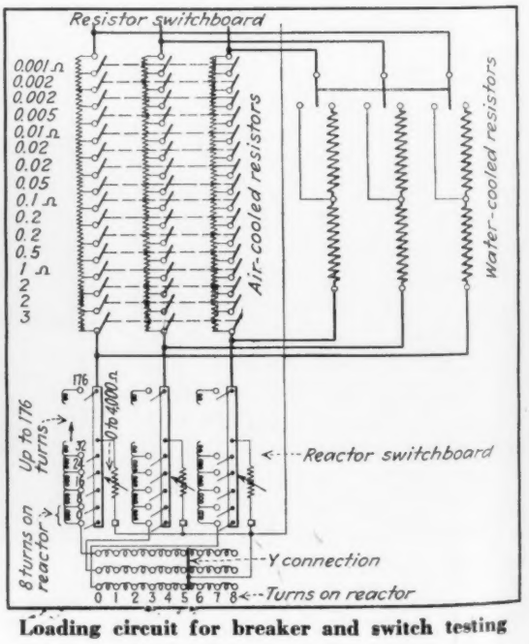
By F. I. WOLTZ
Raleigh, N. C.

It is frequently desirable to determine in advance of the installation of capacitors for power-factor correction whether a resonant condition will result when load is light and the condenser is installed near the service entrance. A simple equation is here developed which it is believed will determine with a reasonable degree of accuracy whether resonance will occur in such cases. Although this equation has not been applied to a sufficient number of cases to determine whether it is entirely dependable, in three cases of condenser resonance studied it gave a condenser



Control board for test loads

At left are resistor switches in decade arrangement from bottom to top. Link and clip connections, instead of switches, are used for the reactor taps on the right.



Loading circuit for breaker and switch testing

Gives men a solid "understanding"

Ever been on a MURRAY Crowsnest? Like standing on top o' the Empire State Building! Your footing's firm. There's room to move about. You don't have to hang on. There's no rocking or swaying. None o' that "all-gone" feeling! Both hands free!

Here's a ladder that's *all* ladder. It swings a *full* circle. See the little pictures to know what it does. No obligation or cost for a comprehensive bulletin that tells all about it. Send for it now.

METROPOLITAN DEVICE CORP., 1250 ATLANTIC AVE., BROOKLYN, N. Y.

MURRAY CROWSNEST

SOLID – as a rock
SAFE – as a baby's cradle!
ABOVE, LEFT:
Makes tree-trimming easy. Up in seconds to 25'8" at 73° angle.
CENTER:
Without obstructing traffic, reaches all overhead, out-of-the-way installations.
RIGHT:
No parking problems. Reaches right over cars at curb with a maximum sideways reach of 9 feet with light trucks—even more with heavy.
Doing a fine job for the New York World's Fair 1939 already. Popular with utilities, park departments, railroads. Send for the facts—free.
NEW YORK
© NYWF

capacity within 15–20 per cent of the actual value that caused resonance.

In cases of resonance investigated by the author the fifth or 300 cycle harmonic was most pronounced. For resonance to exist the inductive reactance must equal capacitive reactance. For 300-cycle resonance of a condenser installation, 60-cycle reactance X_c, served over a lightly loaded three-phase line, having reactance X_L from a transformer bank with reactance X_t

$$5\,X_L + 5\,X_t = \frac{X_c}{5} \qquad (1)$$

For analysis it is convenient to reduce all values to an equivalent Y circuit. To give the same percentage voltage drop in a Y and a delta circuit, the equivalent Y transformer *reactance* would be one-third the *reactance* of one of the three delta-connected transformers; similarly in a delta-connected condenser the equivalent Y condenser *reactance* would be one-third of the *reactance* of the capacity across one phase.

In a 50-kva., 220-volt, delta capacitor the capacity in each leg of an equivalent Y circuit would be $50/3 = 16.67$ kva. The corresponding X_c for 60 cycles would be 0.97 ohm. Since X_c varies as the square of the voltage and inversely as the kva., we may write the following proportionality expression relating to reactance of any kva. size capacitor operating at any other voltage E than 220:

$$\frac{X_c}{0.97} = \frac{50}{KVA} \times \left(\frac{E}{220}\right)^2 \qquad (2)$$

$$X_c = \frac{0.97 \times 50}{KVA} \times \left(\frac{E}{220}\right)^2 = \frac{48.4}{KVA} \times \left(\frac{E}{220}\right)^2 \qquad (3)$$

Substituting this value of X_c and the equivalent Y transformer reactance $X_T = X_T$ in equation (1) for the condition of 300-cycle resonance we get:

$$\frac{5X_T}{3} + 5X_L = \frac{48.5}{5KVA} \times \left(\frac{E}{220}\right)^2$$

solving for KVA that will result in 300-cycle resonance:

$$KVA = \frac{5.82}{3X_L + X_T}\left(\frac{E}{220}\right)^2 \qquad (4)$$

X_L = reactance of one conductor of three-phase line.
X_T = total reactance of one transformer of three-phase delta bank.
E = transformer voltage (delta connection) or voltage rating of condenser.
KVA = Total three-phase condenser capacity in KVA at voltage E.

To avoid resonance the condenser capacity installed should be 40 per cent below the critical value given.

•

Measure Diffusion of Street-Light Globe

Coincident with the development of tentative specifications for street-light globes, a photo-electric device was developed by the Electrical Testing Laboratories, New York City, for measuring the diffusing quality of globes for street-lighting service.

Two photo-electric cells are used in this device. One measures the average candle-power in a direction 80 deg. from the nadir and the other measures the candle-power in the same direction with a screen so shaped and dimensioned as just to obscure the bright spot, interposed between the globe and the photocell in line with the lamp filament.

The first cell measures the light from the entire globe and the second measures the light from all parts of the globe except the bright portion in line with the filament. The ratio of the second measurement to the first, therefore, is considered a measure of the diffusing quality of the globe. All measurements are made while the globe is turning on a motor-driven turntable.

•

Germans Develop New 125-Kv. Cable

A new German oil-filled cable designed to operate at 125 kv. and made in continuous lengths of 1,650 ft., in order to avoid the need for joint boxes, is described in a recent issue of the *Electrical Review*. It has been laid as six single conductors, side by side in troughs, to form two separate groups of cables, each group being of sufficient capacity to carry the whole load. This arrangement obviates risk of an interruption of supply, since failure might cause solidification of the electrolytic melting baths at the Rheinfelden aluminum works, where the new cable has been installed to connect nearby overhead lines with the rectifier house.

The cable has a hollow aluminum conductor consisting of two layers of flat section wire stranded around an internal spiral. The active cross-section is 0.147 sq.in., which gives sufficient protection against a thermal short circuit. The thickness of the insulation is 0.53 in.

The lead sheath is protected against corrosion by means of a suitable coating and a spiral of Aldrey tape serves as reinforcement against internal pressure. Further protection in the form of bitumen-covered india rubber guards against stray ground currents and chemical attack. A final layer of flat wire and an outer protective coating complete the cable.

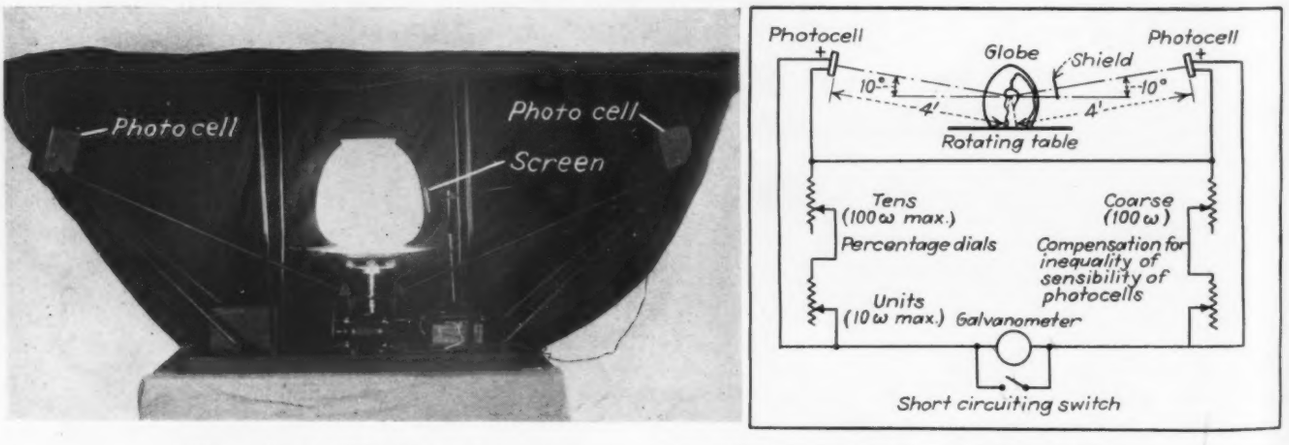


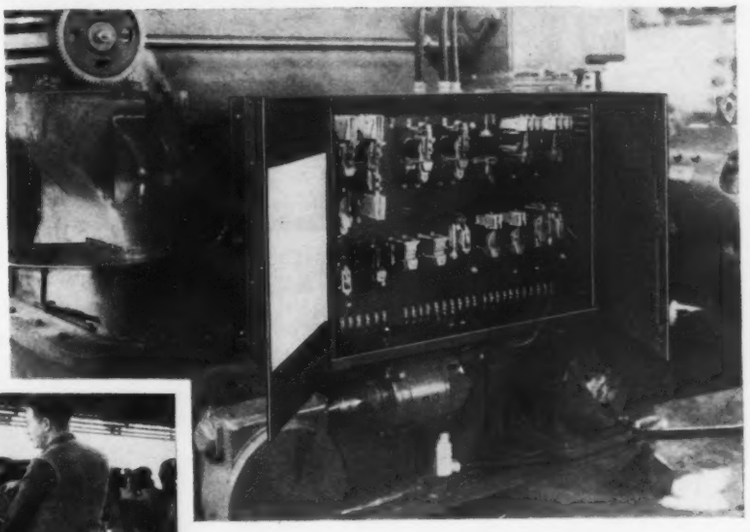
Photo-electric diffusion equipment measures light diffusing quality of street-light globes

Monitor Automatic Control

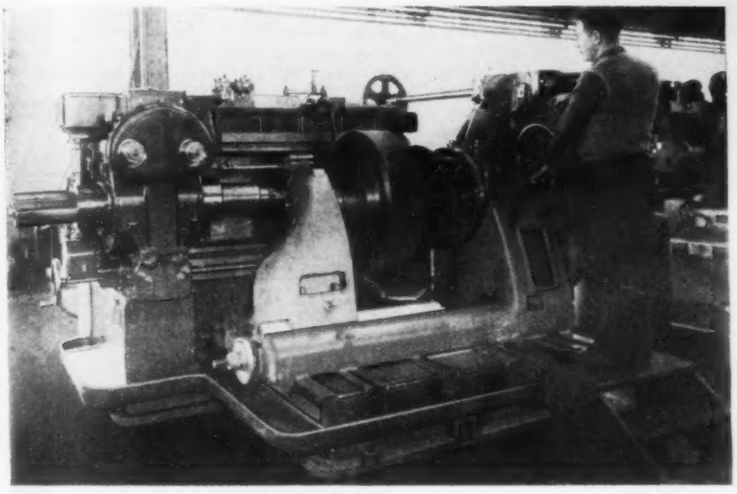
for

FARREL-SYKES

Gear Generators



Close up view of rear of Farrel-Sykes Gear Generator showing the three motors and controller panel.



Front view of Farrel-Sykes Gear Generator.

Monitor

AUTOMATIC ELECTRIC MOTOR CONTROL

Monitor builds standard controllers, starters, and accessories, also custom-built apparatus for any electric motor control problem, no matter how complex. Monitor sales engineers in principal cities will gladly consult with you. Write us.

THE present-day Farrel-Sykes Gear Generators embody many superior features and refinements of design. They are the result of continuous development based on experience with the design, manufacture and operation of a large number of machines over a period of many years. These machines do a wide range of work with great facility, speed, accuracy, and economy. Yet with all the refinements of this machine, the remarkable results would be impossible without the aid of automatic motor control. **Monitor controllers** were especially designed to bring out the refinements of the machines as intended by the Farrel-Birmingham Co.

The controller illustrated governs the functions of the three motors mounted on the machine . . . one 10 H.P. 220 Volt D.C. variable speed motor provided with dynamic braking; one 1 H.P. motor operating the cutting head forward and reverse providing dynamic braking in either direction; and one ¾ H.P. oil pump motor. All of these motors are provided with thermal overload protection and low voltage release. **Assembling the three controllers on one panel and in one cabinet makes a compact unit which facilitates wiring and mounting on the machine.**

This is another example of a Monitor custom-built controller made from standardized parts, including special mechanical and electrical advantages not possible in standard control.

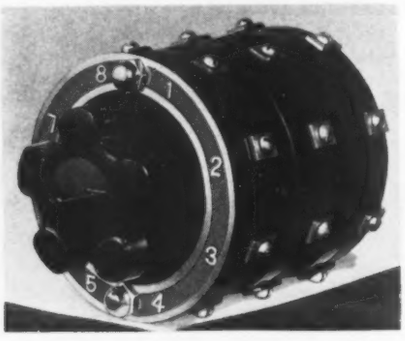
MonitorControllerCompany

GAY, LOMBARD & FREDERICK STS. **BALTIMORE, MARYLAND**

New EQUIPMENT AVAILABLE

Current Control Switch

Fully inclosed construction of this new rotary current control switch reduces the possibility of contact burning, since oxygen is excluded from the contacts. Brass contacts and phosphor bronze fingers are used;



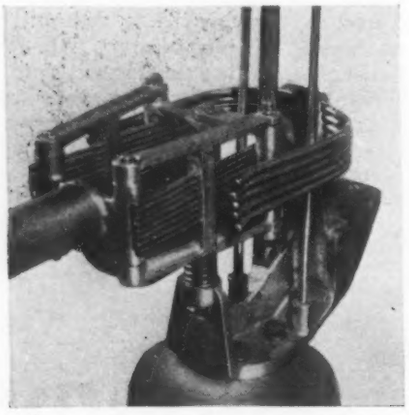
Ganged type current control switch; also available in single-unit type; rated at 250 volts; capacities, 10 amp. on d.c. inductive circuits, 20 amp. on d.c. non-inductive circuits; 30 amp. on a.c. circuits not too highly inductive. **Kneisley Electric Co.,** Toledo, Ohio.

eight positions are provided. In the ganged type switch illustrated, for polyphase, "Y"-connected circuits, all output current is controlled by one insulated control handle of bakelite, simplifying the operation and making for balance in all three phases.

•

Gang-Operated Disconnects

Multi-point pressure, flexing contacts of a new line of rotating insulator gang switches are actuated through a simple toggle mechanism, which provides sleet-breaking action. Opening the switch, the toggle is broken and, simultaneously, the two jaws of the contact head are contracted. After this pressure is released, the blade moves upward to a point where its center of gravity is about four inches past dead-center position. Ball bearings in the blade mechanism and under the rotated insulator further facilitate ease in operation.



Contact head assembly of rotating insulator type, gang-operated disconnect switches; in ratings of 7.5 kv. through 115 kv. **James R. Kearney Corp.,** St. Louis, Mo.

•

Electric Arc Welder

"Plug-in" type control panel on this electric arc welder provides for quick heat changes; to obtain the heat desired it is only necessary to plug the heat selector into the proper slot on the control panel.

Model "300"; ten heats, from 25 to 300 amp.; operates on 220 volts, 60 cycles. **Commonwealth Manufacturing Corp.,** 4208 Davis Lane, Cincinnati, Ohio.

Forced draft cooling system is another feature; air is drawn in through gratings at the bottom of the welder, forced upward by a fan over the transformer, coils and reactance unit and out through gratings at the top.

•

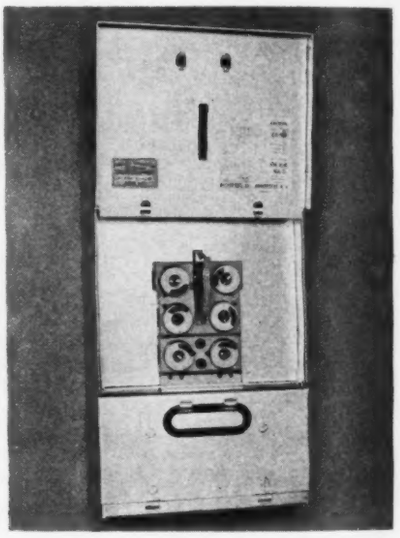
Weld-Cleaning Compound

"Spatter Film;" in quart, gallon, 5-gal. and 55-gal. sizes; 1 gal. covers 50,000 sq. in. of surface. **Lincoln Electric Co.,** Cleveland, Ohio.

Said to reduce the cleaning time after welding, this compound, which is soluble in water, reduces the tendency of "spatter" to adhere tightly and thus facilitates its removal. Non-inflammable and containing no free alkali, the compound may be applied with an ordinary brush to cover the work adjacent to the seam or joint, and may be removed with a clean cloth or be washed off.

Service Equipment

New combination service equipment for range, water heating and lighting is said to be the first to combine in one unit these features: 100-amp. fuseless main switch,



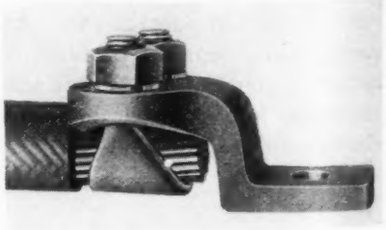
Catalog No. 104-W; available also without water heater cutout. **Anchor Mfg. Co.,** 40 Oliver St., Boston, Mass.

60-amp. fusible range switch, four lighting circuits and water heater cutout. Dead-front construction with solderless connectors is utilized.

•

Cable Connectors

New cable connector is recommended by the manufacturer for connecting a wide range of cable sizes without keeping an extensive stock of lugs on hand. Its

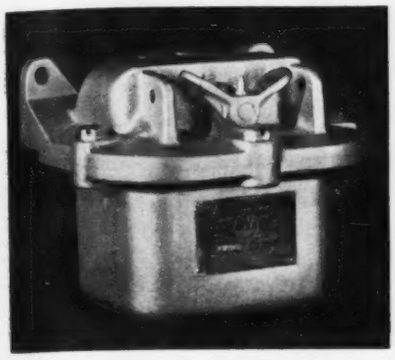


"Varilug" connector, type "VA"; also furnished in form of angle lugs, T-connectors, end-on-end joints, elbows, stud clamps, reducers, etc. **Burndy Engineering Co., Inc.,** New York, N. Y.

flattened U-bolt makes it possible to use the connector on many sizes of cable and also prevents damage to highly compressible flexible and extra-flexible cables.

Push-button Stations

A new line of heavy-duty push-button stations has been designed for use in corrosive atmospheres and in Class I, Group D hazardous locations. Explosion-proof,



Explosion-proof push-button station, type "HD." **Westinghouse Electric & Mfg. Co.,** East Pittsburgh, Pa.

with or without oil in the station, the units are available with from one to four standard push-button units of the momentary contact type, or with maintained contact units. They are also available with two or three position selector switches, either as single-pole double-throw or double-pole single-throw switches.

•

Cable Outlet Head

Conduit cable head uses a flanged cast-iron conduit coupling, a non-magnetic aluminum cast aluminum plate with disk

Type "RC" conduit cable outlet head nipples fit single-conductor, 600-volt cables up to 500,000 circ.mil. **G & W Electric Specialty Co.,** Chicago, Ill.

for grounding individual cable sheaths and the "Resistoyl" rubber compound insulating fitting provided with a flange and two, three or four tapered nipples. Nipples are simply taped to cable insulation to provide a moisture seal.

•

Special Insulations

"Okoprene," "Okoseal" and "Okoglass" insulations. **The Okonite Co.,** Passaic, N. J.

Three special insulation materials developed by this company's research department have been successful in solving familiar but troublesome cable problems. "Okoprene," a synthetic rubber-like compound with high dielectric strength, moisture-, oil-, solvens- and chemical-resistant, is suitable for portable cables and for cables in ducts filled with contaminated water, also for exposed aerial and pole riser cables. "Okoseal" provides a flexible, leather-like insulation and sheath that is non-inflammable yet moisture resistant, and is especially adaptable for use on switchboards and similar locations. Finally, "Okoglass" insulation is for conductors in use on circuits where extremely high ambient temperatures are met.

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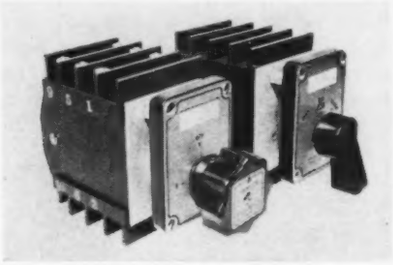
Rotary Switches

New rotary switches for instrument and control use are designed to cover completely the field of apparatus control, whether the requirement is special or standard, on circuits up to 600 volts. They



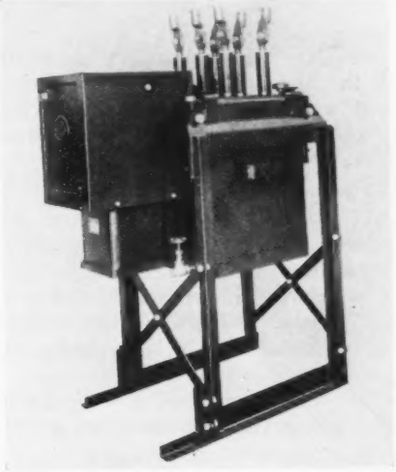
Type "R-2" rotary switches; instrument switch at left, control switch at right. **Roller-Smith Co.,** New York, N. Y.

are identical in construction and space requirements, differing only in method of operating contacts, a snap-action position locator being used on the instrument switch and a spring return assembly in the control switch. Instrument switches are for all types of instrument transfer for voltage and current coils; control switches for circuit breakers, governors, rheostats and miscellaneous equipment.

•

Oil Circuit Breaker

The single-port, cross-blast principle of arc extinction is used in this new 100,000-kva. interrupting rating indoor oil circuit breaker, which has heavy-duty butt-type arcing contacts and silver-to-silver main current-carrying contacts. Operated either

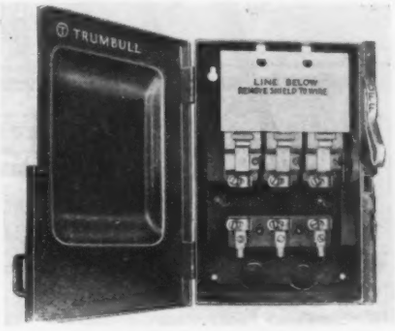


Type "FK-46" oil circuit breaker; 15 kv., 600 amp., three pole, single-throw. **General Electric Co.,** Schenectady, N. Y.

electrically or manually, the new breaker is suited for industrial as well as central station and railroad applications, being particularly adapted for use in steel mills in feeders, motors, incoming lines and at other places where frequent operations are necessary.

Industrial Switch

For convenience and ease in wiring, new industrial safety switches, superseding this company's "RB" line, have interiors mounted on a removable saddle with all terminals accessible from the front. A



"RBA" switches; 30 to 600 amp., two and three pole, 230 to 575 volts, a.c.; 250 to 600 volts, d.c.; fusible and no fuse types. **Trumbull Electric Mfg. Co.,** Plainville, Conn.

convenient front handle combines advantages of front and side operation and permits close ganging of switches. Heavy cover catch and releasable interlock, wiring gutters and solderless connectors are other features.

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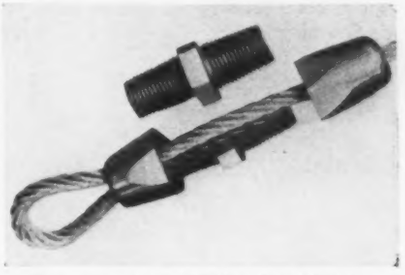
Wire Rope Clamp

Although developed for marine use, a new wire rope clamp should find service in utility applications as well. Designed to eliminate splicing and serving, the clamp



Wire rope clamp. **Marine Specialty Co.,** 3178 Bellevue Ave., Detroit, Mich.

when properly assembled will hold the strength of plow steel cable according to the manufacturer.

•

Heating Units

"Calrod" heating units; standard ratings are from 750 to 3,500 watts and effective heating lengths from 18 to 84 in. **General Electric Co.,** Schenectady, N. Y.

A new high-speed "Calrod" heating unit has been developed for industrial applications that require temperatures as high as 1,500 deg. F. Among uses of product are applications in high-temperature air heating, industrial ovens with air temperatures up to 1,000 deg. F., and hot plates.

•

Ladder Mount

"Keystone" ladder mount. **Electric Service Supplies Co.,** Philadelphia, Pa.

This company has recently brought out a new and improved ladder mount, available with an extension ladder of 24, 26 or 28 ft. Through an error, these extension ladder lengths were given as 24, 26 and 28 in. in ELECTRICAL WORLD for August 13, 1938.

News ABOUT PEOPLE

Westinghouse Names Newbury Division Head

Frank D. Newbury has been appointed manager of the new products division of the Westinghouse Electric & Manufacturing Company to succeed the late Herbert M. Wilcox. In addition to this development of activities for Westinghouse in new fields, Mr. Newbury will continue his present duties as economist for the company.

Born in Brooklyn, N. Y., and a graduate of Cornell University in mechanical engineering, Mr. Newbury has occupied a number of positions from apprentice to general manager of machinery engineering over a period of 30 years.

Besides carrying on his engineering design work he edited the *Electric*

Journal when it was established in 1904 and was president of the Electric Club (now the Westinghouse Club) during 1906 and 1907. From 1918 to 1930 he was active in the American Institute of Electrical Engineers, as a director from 1918 to 1922 and as a member of the standards committee and rotating machinery committee. He was one of the representatives of the A.I.E.E. on the American Standards Association. In 1935 Mr. Newbury became assistant to the vice-president on budgets and other administration problems, and later economist.

► FRANK M. MCKEOWN, formerly Senator in the state legislature and lately secretary to Gov. C. F. Hurley, has been confirmed in his appointment as chairman of the Massachusetts Department of Public Utilities.

► MARTIN JUHL has resigned as Park Falls, Wis., manager of the Lake Superior District Power Company, to become manager of the Michigan Gas & Electric Company at Dowagiac, Mich. He is succeeded at Park Falls by Harry Samuelson, formerly of Hayward, Wis.

► DR. A. C. LANIER, professor of electrical engineering, was appointed acting dean of the College of Engineering of the University of Missouri at a recent meeting of the board of curators.

► MARION S. FRANCIS, lawyer, of Mexico, Mo., and Scott Wilson of St. Louis have been appointed members of the state Public Service Commission by Gov. Lloyd C. Stark. Mr. Francis, who is filling the place made vacant by the death of Albert D. Nortoni of St. Louis, will serve until 1941. Mr. Wilson, formerly chairman of the Missouri Highway Commission, will succeed William M. Anderson, whose term has expired. Mr. Wilson is to serve until 1943.

► F. R. KOHNSTAMM has been appointed manager of the agency sales department recently created by the Westinghouse Electric & Manufacturing Company. His headquarters will be in Cleveland. Mr. Kohnstamm will continue his present duties as manager of the lighting division, also located in Cleveland. The responsibilities of the new department will be to develop sales volume for all apparatus of the company, other than domestic equipment, lamps and certain other products now sold through retail channels, that are distributed through sales agencies appointed by the company. Mr. Kohnstamm has been associated with Westinghouse since 1917.

I. H. Sclater of Pittsfield Assigned Managerial Duties

I. H. Sclater has been appointed managing engineer of the power transformer department of the Pittsfield works of the General Electric Company. In his new capacity Mr. Scla-

ter is in charge of both the engineering and manufacture of G.-E. power transformer equipment.

Mr. Sclater has been continuously associated with General Electric since 1906, when he entered the company as a test man. He was placed in charge of the design of oil-insulated transformers in 1923, and in 1931 became assistant engineer of the transformer engineering department. It was in 1933 that Mr. Sclater was made engineer of the power transformer engineering department, the position he held until his present promotion.

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► A. H. CAESAR, JR., has been named executive secretary of the domestic appliance section of the National Electrical Manufacturers Association. Mr. Caesar has been a member of the N.E.M.A. staff for several years, serving as executive secretary of the radio apparatus and electronic tubes section and in an advisory capacity to a number of other sections. During NRA days

NEW DESIGN *that provides great mechanical strength*

COMBINED WITH SUPERIOR ELECTRICAL PERFORMANCE

3 SIZES

TYPE 680—FOR VOLTAGES UP TO 15,000
TYPE 670—FOR VOLTAGES UP TO 10,000
TYPE 660—FOR VOLTAGES UP TO 8,000
Handle most PRIMARY line requirements

● Not only will the initial savings please you but their low-cost performance in the line will confirm your judgment in specifying the new series-600 Hemingrays.

Hemingray tougher glass insulators never age, are easy to inspect, and now provide greater leakage distance because of the new design.

Manufacturing processes are more accurately controlled than ever before, resulting in uniform production and dependability in service under heavy loading or severe weather conditions.

Make that next order read "Hemingray series-600 Glass Insulators"—they are brass-bushed for greatest strength. Send for samples.

Owens-Illinois Glass Company, Hemingray Division, Muncie, Indiana.

HEMINGRAY INSULATORS

OWENS-ILLINOIS GLASS COMPANY

"First in Glass"

Mr. Caesar was an assistant deputy administrator and was co-author with Willard L. Thorp of the NRA study entitled "A Study of Open Price Filing in the Electrical Manufacturing Industry."

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District Transfers Made by Iowa-Nebraska Utility

Iowa-Nebraska Light & Power Company has announced the transfer of a number of district managers and superintendents.

Edward M. Kennedy, superintendent of service for the company in Lincoln, has been appointed district manager at Avoca, Iowa, succeeding A. C. Bennett, who has been Avoca district manager since 1933, and who now becomes district manager at Shenandoah, Iowa, one of the company's larger districts. Mr. Kennedy has been with the company in Lincoln since 1926.

Other changes include the following:

H. F. Boehner, district manager, Shenandoah, to district manager at York, Neb.; R. A. Graham, district manager, York, to the engineering staff, general office, Lincoln; Dwight Edwards, superintendent at Geneva, Neb., to same position at West Point, Neb.; Charles M. Humphrey, superintendent at Osceola, Neb., to same position at Geneva; Charles Hastings, service department, Osceola, to superintendent same location; L. L. Ellwood, superintendent, West Point, to same position at Tekamah, Neb.

•

▶ NEWBOLD C. GOIN succeeds L. R. BOTSAI as sales manager of the Westinghouse Electric & Manufacturing Company's gearing division, Nuttall Works, Pittsburgh, according to a recent announcement by R. S. Marthens, manager of the division. Mr. Botsai was recently transferred to the sales managership of the company's small motor division at Lima, Ohio. Mr. Goin has been associated with Westinghouse since 1917.

▶ F. H. DOREMUS has been appointed district manager, industrial department, Rocky Mountain district, General Electric Company, according to an announcement by A. L. Jones, commercial vice-president. Mr. Doremus assumed his new duties August 1, sixteen years to the day after he had become associated with the company as a "test" man at the Schenectady Works. He worked in Schenectady in the capacity of an industrial engineer until 1925, when he was transferred to the industrial department of the Denver office. In his new position Mr. Doremus succeeds Henry C. Glaze, whose voluntary retirement under the company pension plan became effective August 1. Mr. Glaze has been continuously employed by General Electric for 39 years.

▶ IRVING C. HARRIS has been appointed director of power in charge of the Boulder Dam project, replacing Ralph Lowry, recently transferred by the Bureau of Reclamation to the Central Valley project, California, where he became construction engineer in charge of Shasta Dam. From 1909 to 1913 Mr. Harris served as the engineer in charge of the power division of the Salt River Federal Reclamation Project in Arizona, and from 1914-1916 as the engineer in charge of inspection of materials and machinery purchased by the Bureau of Reclamation. After a sixteen-year period, during which he practiced as a consulting engineer, Mr. Harris returned to the Bureau of Reclamation in 1933. For two years he was employed as an engineer on factory inspection, principally in connection with the machinery being manufactured for the Boulder Dam power plant. Since 1935 he has been in charge of electrical and mechanical inspection of equipment at the Boulder Dam power plant. Upon the transfer of Mr. Lowry to Shasta Dam, near Redding, Calif., Mr. Harris became acting construction engineer of the Boulder Dam and power plant.

▶ JOHN C. JONES, for many years connected with the sales department of Westinghouse Electric & Manufacturing Company, Los Angeles, has retired. A graduate of the University of Nebraska, he entered the electrical industry with the Crocker-Wheeler Company. In 1900 he joined Westinghouse, with which organization he remained until his retirement. As sales engineer and, later, manager in the company's Salt Lake City office Mr. Jones was active in the early irrigation and power developments of Utah and Idaho. In 1920 he was transferred to the Los Angeles office, where he devoted his time exclusively to the utility phase of the work.

▶ OSCAR P. CLEAVER, a commercial engineer of the Westinghouse Lamp Division, Bloomfield, N. J., in charge of the illumination section, has been elected chairman of the New York section of the Illuminating Engineering Society for the year beginning October 1. While in the Middle West Mr. Cleaver served as chairman of the Chicago section of I.E.S., 1934-35. Since 1930, when he taught illumination at Yale University, he has been active in lighting circles and prominent in management of illumination organizations. He is one of the original sponsors of the Better Light-Better Sight movement.

OBITUARY

A. V. Grief

A. V. Grief, vice-president and general manager of the Gary Heat, Light & Water Company, Gary, Ind., died August 16, in his fortieth year. Mr. Grief had been in Indiana since 1935, when he went to Gary as financial adviser to A. C. Colby, president of the utility company. Before becoming affiliated with the Gary properties Mr. Grief had been connected with the Pierce-Arrow interests, at first with the Sales Corporation in New York as vice-present and treasurer and then as assistant to the president of the Pierce-Arrow Company, with headquarters in Buffalo. It was from this position that he resigned to join the Gary utility.

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▶ GLENDON C. BROWN, an electrical engineer at the plant of Cutler-Hammer, Inc., Milwaukee, for the past ten years, died suddenly August 10, in his thirty-second year. Mr. Brown was a member of the American Institute of Electrical Engineers.

▶ CHARLES HOPPER, well-known Canadian sales engineer, died suddenly August 7 in the Toronto General Hospital. Mr. Hopper was closely associated with the municipal electric utilities in Ontario and, especially in recent years, with the mining industry in northern Ontario and Quebec. Born in New York, he entered the electrical industry in that city selling and later manufacturing and servicing carbon arc lamps. When these lamps were supplanted by more efficient illuminants he engaged in selling electrical appliances, and in this field went to Canada with the Canadian Westinghouse about 1916. Subsequently he became sales manager for the Kelvinator Company of Canada, and in 1927 affiliated himself with Ferranti Electric, Ltd. Mr. Hopper was an active member of the Electric Club and Engineers' club of Toronto. He took an active interest for a number of years in the Electric Service League.

▶ GEORGE P. JAMES, formerly chief engineer of Puget Sound Power & Light Company, died in Seattle July 15. He was 70 years of age.

Manufacturing AND MARKETS

Ross Calls for Bids on Insulator Order

What is said to be the largest insulator order in recent electrical history was offered to electrical equipment manufacturers last week when Administrator J. D. Ross called for bids on material for the Bonneville transmission network. Nearly a quarter of a million heavy-duty insulators will be purchased for the 540 miles of high-tension line to carry Bonneville power into Oregon and Washington.

Insulators will be made of vitrified porcelain, will measure 10 in. in diameter and nearly 6 in. in height. They will be suspended in strings of ten to twenty units and will be required to withstand an impulse flashover of more than a million volts. Samples submitted will undergo a series of tests and must have a service record of at least eight years on ten separate projects. Bids will be opened on September 15.

Of the new order 137,000 insulators are for the line connecting Bonneville Dam with Grand Coulee Dam, 43,016 for the line through Portland to Eugene, 13,968 for the circuit from Bonneville to The Dalles and 49,904 for the line running northward to Kelso and Aberdeen.

This latest order followed the receipt of bids on 35,400 insulators for the 220,000-volt "backbone" line from the dam to Vancouver. Bids were submitted by ten leading manufacturers and ranged from $26.500 to $45.336.

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To Revise Rubber-Covered Wires and Cables Standards

Underwriters' Laboratories, Inc., is about to revise and reissue the standard for rubber-covered wires and cables, the new edition to supersede that of March, 1932, now in effect.

The most important changes in the new edition will be the substitution of accelerated aging tests for the chemical tests and the introduction of new requirements covering the performance and superaging grades—the earlier edition having covered only the code grade.

Persons interested in commenting on the proposed revision may obtain copies of the preliminary draft from the New York office of the laboratories, at 161 Sixth Avenue, returning their suggestions up to September 24, 1938.

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Electrical Manufacturer Moves to New Quarters

So far in August business of the O. Z. Electrical Manufacturing Company, Inc., has shown a progressive increase, according to M. J. Cafiero, president. Mr. Cafiero stated that July was the best month so far this year and that outlook for fall business was most promising.

Specializer in electrical specialties, the company recently moved into its new quarters at 262 Bond Street, Brooklyn, N. Y. The shop contains latest machinery for manufacture of solid connectors, conduit fittings, cable terminators and special electrical equipment.

Outlook Favorable for Domestic Copper

With domestic consumption of copper gradually expanding, most producers are confident that August deliveries will exceed those for July, which were the largest since October, 1937, it was learned last week.

The July statistics, as reported last week by the Copper Institute, were seen as even better than had been expected, with combined foreign and domestic stocks of refined copper decreasing 28,299 short tons in the month, reflecting increased deliveries. Domestic deliveries were 41,249 tons in July, as against 32,863 in June and 67,356 in July a year ago. Deliveries abroad, including domestic and foreign copper, totaled 126,533 tons and were the second highest on record, the record being 129,577 tons in April this year.

While domestic production of refined copper was higher in July than in June—35,596 tons against 32,465—production of blister or crude copper declined both here and abroad, domestic production in July amounting to

NEW PLANT—New modern offices and shops of the O.Z. Electrical Manufacturing Company, Inc., in Brooklyn, N. Y., which were recently opened

31,304 tons, against 38,200 in June. Thus the total reduction in world stocks, both refined and crude, was 40,006 tons.

•

Aluminum Company Secures Two Equipment Contracts

Aluminum Company of America has been awarded a contract for the conductor on Bonneville's first transmission line from the plant to Vancouver, Wash., on a bid of $286,934. The specifications for the line called for high-strength conductor. The cable offered was 795,000 circ.mil A.C.S.R. The line, about 40 miles long, will operate at 115,000 volts, although it is designed for 230,000 volts.

The company also secured recently a contract for 550 miles of aluminum conductor for the third section of the rural electric system of the Tri-County Electric Membership Corporation, Lafayette, Tenn., totaling about 345 miles of territory, for which the construction award was made recently to R. H. Bouligny, Charlotte, N. C., at $171,812. An award for 475 line transformers for this project has been made to Westinghouse Electric & Manufacturing Company.

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National Laundry Week

Utilities, manufacturers and outlets are co-operating to inaugurate national washer and ironer week during the week of October 23, at which time effort will be made to stimulate greatly the home laundry market.

The American Washer and Ironer Manufacturers Association and the Edison Electric Institute have joined in the drive with the slogan "For Family Washing There's No Place Like Home."

The manufacturers are placing display material at the disposal of the utilities and their dealers without charge.

•

Tips Tool Company Moves

Offices of the Tips Tool Company, division of A. B. Chance Company, are being moved to Centralia, Mo., from Taylorville, Ill. After September 1 all orders and other business will be handled through the office in Centralia.

New York Metal Prices

	Aug. 17, 1938 Cents per Pound	Aug. 23, 1938 Cents per Pound
Copper electrolytic	10.125*	10.125*
Lead Am. S. & R. price	4.90	4.90
Antimony	10.75	10.75
Nickel ingot	35.00	35.00
Zinc spot	5.15	5.15
Tin straits	43.00	42.875
Aluminum, 99 per cent	20.00	20.00

* Delivered Connecticut Valley.

Field Reports on Business

Indications that fall business may move ahead of last year are becoming more pronounced. Utilities are planning more construction before the year end, with good budgets promised for 1939. Appliance sales drives are shaping up with a good appeal to housewives.

NEW ENGLAND

Stone & Webster Engineering Corporation, Boston, has been commissioned to build an addition to the Twelfth Street steam plant of the Virginia Electric & Power Company, Richmond, and contracts will be placed soon for a 40,000-kw. generator, boiler and auxiliary equipment. Great Northern Paper Company has ordered two 4,500-hp. water-wheel-driven generators for a new 18,000-hp station being built by the company on the Penobscot River in Maine. A transmission line about 9 miles long will be built from the station site at Mattaceunk to the Millinocket area. Central Maine Power Company has resumed work on the reconstruction of the dam at Solon, on the Kennebec River, but has made no commitments as yet for generating capacity at this site. Public Service of New Hampshire is completing a 20,000-kw. steam plant addition at Manchester for October operation. Industrial plant developments reflect an expanding market for electrical supplies and equipment.

Metropolitan Electrical League, Boston, will start a vigorous campaign for adequate wiring early in September. Electric fan sales have been exceptionally good and appliances are in healthy demand on most systems. Two Vermont areas report 44 refrigerators and thirteen electric ranges sold last week, and the advent of the county fair season presages an expansion of the household and farm appliance trade as these devices are yearly displayed and more effectively demonstrated at these gatherings. Wire and cable sales are showing modest improvement, with considerable government business in hand.

Energy outputs of leading utilities reflect industry stability. Carpenter Manufacturing Company, Cambridge, Mass., has received initial orders for equipping the maintenance departments of Public Service Electric and New Jersey Bell Telephone with its new "T & T" duplex crossarm and floodlight units.

PACIFIC COAST

Varied reports are made by different Pacific Coast districts of August business, but they average a fair increase so far over July and are apparently approaching August, 1937, figures. Advance bookings of table appliances indicate an excellent holiday season, though summer sales are running 15 per cent below last year. Lighting material sales are good, with schools and hospitals predominating in new work. Three miles of Bayshore near San Francisco are being experimentally equipped with floodlights on 30-in. posts, with assurance that many hazardous sections throughout the state will be similarly equipped if the tryout is successful.

Hickam Field in Hawaiian Islands has awarded contracts totaling $160,000 for night flying and street lighting and secondary distribution system, and Long Beach, Calif., is re-equipping 106 standards. Westinghouse is adding two buildings to its East Bay plant and General Electric revised plans for a combined office, warehouse and shop building in San Francisco call for $1,500,000 expenditure.

Some exceptionally large contracts for government projects are reported, including $207,400 for Alcatraz prison power house; $80,000 for Imperial Irrigation district switchboard and substation; $10,000 for Riverton, Wyo., project disconnect switches and lightning arresters; also an award for $47,729 covering 70,000 Ohio Brass insulators for Kendrick, Wyo., and Big Thompson, Colo. projects. Bids are to be opened on September 7 for two, each 14,000-hp., turbines and 12,500-kva. generators for Grand Coule and on September 13 for two turbines of 74,000 hp. for Bonneville plant.

NEW YORK

Buyers coming into the area during the past week are much pleased with the prospects of a good pickup in business over the next few weeks which is expected to continue for some time. Orders received by wholesalers and distributors indicate that business is likely to reach last year's level and in some cases push ahead.

Housing is being rushed before the cold weather sets in, which has stimulated wiring and electrical fixture business. Starting September 1 Consolidated Edison System will launch its gigantic package appliance sales campaign, with 900 approved dealers joining in the drive. Salesmen are pepped up over the prospects of selling more than 125,000 packages containing an electric iron, toaster, lamp and radio.

Electrical manufacturers report an increase in inquiries for new equipment. The $3,000,000 Virginia Electric & Power addition is indicative of the way the utilities are planning to move as power production gets higher. The placing of orders this week by automobile manufacturers for 1939 models is expected to speed work in many industries.

CHICAGO

As Labor Day draws nearer, anticipation of positive signs that business is moving toward recovery becomes more keen. Retail sales continued at an even pace of approximately 8 per cent below a year ago. This showing was better than the national average, which declined 12 per cent from last year. Air-conditioning systems installed in July numbered 47, as compared with 44 a year ago. A total of 104 portable room coolers were sold during the month, a decline of 48 from last year. Electrical energy output rose 3 per cent above the previous week and stood 4 per cent below the level a year ago.

Industrial activity continues to be slow in picking up. However, reports indicate that the trend is upward as a number of propositions are opening up, with a great many more in the planning stage waiting to break at a favorable time. The Electro-Motive Corporation has received an order for sixteen Diesel-electric locomotives. A 25,000-kva. generator will be installed in a nearby town.

Recent Rate Changes

NEW JERSEY POWER & LIGHT COMPANY customers will save $283,000 annually as a result of a reduction in electric rates on September 1, Harry Bacharach, president of the state Board of Public Utility Commissioners, has announced. The reduction is apportioned for residence, $7,735; power, $98,350; general service, $82,025; street lighting, $25,075.

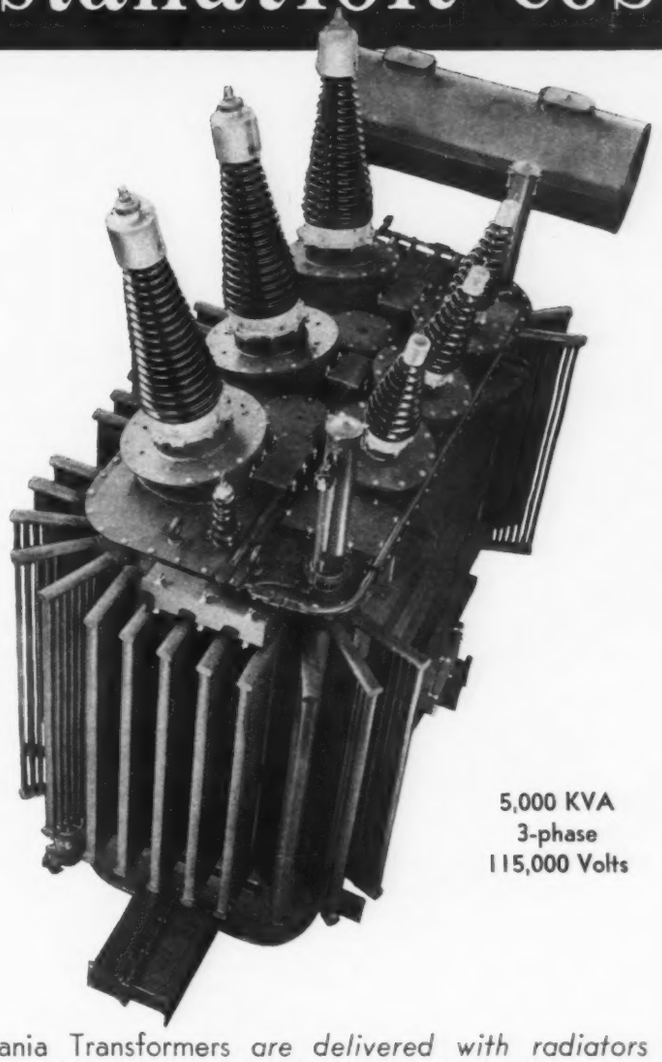
CONSOLIDATED EDISON COMPANY has filed with the New York Public Service Commission an amended rate schedule, converting its rate for light, heat and power for wholesale uses from an annual to a monthly basis. The change is expected to cause a net decrease of $265,000 a year in the electric bills of about 800 consumers in Manhattan and the Bronx. The rate changed is a block rate available for all purposes, with a minimum charge of $3,750 a year in Manhattan and $3,000 a year in the Bronx. Changing the rate to a monthly basis makes applicable the new standard fuel adjustment clause, accounting for most of the estimated reduction in consumers' bills. The commission also announced that a similar rate change in the same classification was being made by the Westchester Lighting Company for territory served in New York City.

LOUISIANA PUBLIC SERVICE COMMISSION has announced that domestic electric rates in 185 cities and towns in Louisiana were reduced, effective August 15. The reductions are the outcome of conferences between the Louisiana Power & Light Company and the Public Service Commission and will amount to approximately 15 per cent of the rates now in effect.

HOUSTON LIGHTING & POWER COMPANY has announced a reduction in rates to its consumers in suburban and rural areas in seven counties outside of Houston. "All incorporated areas will enjoy the same reductions," H. O. Clarke, Jr., vice-president and general manager, said. "The reductions to farmers and others living in outlying districts will be made on a slightly different basis. The service charge of 60 cents has been removed in incorporated towns and a $1 minimum charge set, with the provision that the $1 will pay for 12 kw.-hr. of electricity. The next 13 kw.-hr. will be charged at the 4.5 cents per kilowatt-hour, the next 50 kw.-hr. at 4 cents each, the next 125 kw.-hr. at 2.5 cents and all over 200 kw.-hr. will be 1.5 cents per kilowatt-hour. Under the former schedule the user paid the 60-cent service charge and paid 4.8 cents each for the first 25 kw.-hr., 4 cents for the next 50 kw.-hr. and 2.5 cents for the next 125 kw.-hr. The new schedule provides that the residential user of 25 kw.-hr. will be charged $1.58. Under the old rate 25 kw.-hr. cost $1.80. The farm rate will be $1.50 and use of the first 12 kw.-hr.; the next 13 kw.-hr. will be 4.5 cents per hour, the next 50 kw.-hr. 4 cents each and 2.5 cents for the next 125 kw.-hr. and 1.5 cents for all larger amounts used. The service charge for the farm formerly was $1.05."

NEW ORLEANS PUBLIC SERVICE'S new rate schedule, effecting an annual saving of $500,000 (ELECTRICAL WORLD, August 13, page 59), is as follows: Residential —10 kw.-hr. or less 90 cents; next 80 kw.-hr. 4½ cents per kilowatt-hour, next 80 kw.-hr. 3 cents per kilowatt-hour, next 230 kw.-hr. 2 cents per kilowatt-hour; each additional, 1½ cents per kilowatt-hour. This compares with the following old schedule: First 50 kw.-hr. 6½ cents per kilowatt-hour, next 50 kw.-hr. 4 cents per

You save in installation cost



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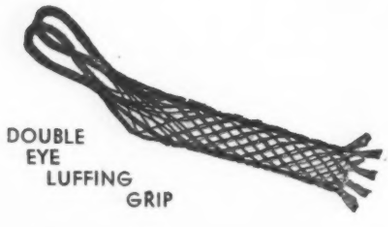

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kilowatt-hour, next 150 kw.-hr. 2½ cents per kilowatt-hour; each additional, 1½ cents per kilowatt-hour. The schedule for small lighting consumers other than residential follow: A minimum bill of 90 cents, entitled the consumer to the use of 10 kw.-hr. per month (same as residential base rate); 5 cents per kilowatt-hour for the next 590 kw.-hr. in excess of the 10 allowed in the minimum bill, 4 cents per kilowatt-hour for the next 800 per month and 3 cents per kilowatt-hour for all additional.

TUCUMCARI LIGHT & POWER COMPANY has announced a new lower rate for electric service, applying to all commercial and small power users, effective July 1. Business firms will save $1,820 a year. The company voluntarily filed this rate on May 12 and made it effective as soon as it was approved by the New Mexico Corporation Commission.

ILLINOIS COMMERCE COMMISSION has announced that the estimated effect upon annual operating revenues of rate changes for electric service in Illinois, which became operative in July, totals $20,661.

•

Municipal Plants

OWENSBORO, KY.—Sale of $1,250,000 of city bonds for construction of a combined light and water plant has been temporarily restrained in an order issued by Circuit Clerk Ben S. McCormick. Proceeds from the sale were to have been coupled with a PWA grant of $1,100,000.

THAYER, MO.—Arkansas-Missouri Power Corporation has asked the state Public Service Commission for permission to remove its electric distribution system from the city. The utility discontinued service on April 14, but restored power a day later upon the order of the commission, which held the company had acted without authority from the commission. The removal of service, the company contends, "will not occasion loss or inconvenience to the public, for the reason that practically all customers have become customers of the city's municipal plant," which the petition says was opened early in July.

DOVER, N. J.—A referendum on a proposal to erect a $500,000 municipally owned and operated electric light and power plant will be held in November. The township committee decided to seek PWA aid. The township is now serviced by the Jersey Central Power & Light Company.

COLUMBUS, OHIO.—City won a victory in the lengthy legal battle for a $1,030,000 municipal light plant extension when Common Pleas Judge Charles A. Leach of Franklin County sustained a motion to dismiss the suit brought by the Columbus & Southern Ohio Electric Company to block the program. In spite of the fact that the utility company will file an appeal from Judge Leach's opinion, city officials laid plans to advertise for bids on the project. The ruling upheld the city's right to issue bonds totaling $824,000 for the extension, to be partly financed with PWA funds. The decision said that the proposed bonds may be issued legally within the city's debt limitations and that the city had complied with the necessary legal steps in preparing for the bond issue after it had been approved at an election back in 1933.

ROBSTOWN, TEX.—City Council has made application for a $151,250 PWA grant to finance a municipal power plant. The city recently voted bonds in the amount of

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$275,000 for an electric distribution and generating plant and $75,000 for a municipal gas plant. The bond election carried, but J. E. Hightower contested the election and the suit is now pending on appeal in the Court of Civil Appeals, the district court having handed down a decision in favor of the city.

KAUKAUNA, WIS.—Common Council has adopted a resolution authorizing the utility commission to borrow $90,000 to enable it to proceed with plans for constructing a hydro-electric power plant.

PARDEEVILLE, WIS.—Wisconsin Public Service Commission in a new order has fixed $25,000 as the price at which the village may take over the Pardeeville Electric Light Company. The new order is substantially the same as that issued by the commission in June.

•

Duke Power Protests Tax

Duke Power Company has filed an appeal with the Essex County, New Jersey, Tax Board for the cancellation of a $15,000,000 personal property assessment levied by the Newark Tax Board. The utility is incorporated in New Jersey and operates in North and South Carolina.

Declaring that it kept in Newark only the necessary records required by State law, the utility asserted that tax-assessing authorities "systematically, intentionally and notoriously failed to assess at its true value, or at all, the intangible property owned by other taxpayers." The appeal is based on the allegation that the company does not do business in New Jersey; that all of its property is situated in North and South Carolina, where taxes are paid on the property in question.

The Purge for Power

[*Continued from page 46*]

of an All-American route—the New York barge canal, for instance.

So how much will this new power supply cost?

Latest estimates — on which the President is trying so hard to sell the lukewarm Canadian officials while he turns his political appeal loose on the Canadian voters—are that it would cost the United States $272,453,000, and it would cost Canad $270,976,000. The resulting power, again according to the latest estimates, would be 2,200,000 hp., to be evenely divided between the two governments.

Assuming that the project can be constructed without exceeding these estimates — though on past performance on such government projects the odds ought to be ten to one that it cannot — the government would have a lot of additional power to sell in northern New York.

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When the Manager learned that their instrument was purchased in 1914, he wrote:

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Sales Opportunities

DE WITT, ARK.—Arkansas Power & Light Company, Pine Bluff, Ark., has approved plans for new transmission line from DeWitt to point on White River, Phillips County, about 20 miles, for power supply for levee construction in that area. About 14 miles of new line will operate at 66,000 volts, and remainder, 13,000 volts. Power substation facilities for step-down service will be located at line terminus.

SALINA, OKLA.—Grand River Dam Authority, City Hall, Vinita, Okla., R. V. L. Wright, general manager, has plans under way for new hydroelectric power station on Grand River, near Markham's Ferry, vicinity of Salina, to include power dam across river at point noted, generating station, power substation and switching station units, and transmission line. Cost about $4,500,000. Financing will be arranged through Federal aid, including federal grant of about $2,025,000. Holway & Neuffer, 302 East Eighteenth Street, Tulsa, Okla., are consulting engineers.

OWENSBORO, KY.—Has plans maturing and will take bids in near future for extensions and improvements in municipal electric power plant, including installation of a 7500-kw. turbo-generator unit with accessories, two boilers and complete auxiliary equipment. Also will make extensions in electrical distribution system and waterworks pumping station, with installation of new electric-operated pumping units. Cost about $2,300,000, of which $1,041,016 has been secured through federal grant. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

PITTSBURGH, PA.—United States Engineer Office, New Post Office Building, receives bids until September 1 for two switchboards, guards and accessory apparatus (Circular 46); also, until September 2 for two 50-kw. gasoline-electric standby power units (Circular 48).

MILLVILLE, W. VA.—Potomac Edison Company, Hagerstown, Md., plans early rebuilding of portion of hydro-electric generating station on Shenandoah River at Millville, recently destroyed by fire, caused by lightning. Loss estimated close to $250,000, including equipment.

GLENDALE, CALIF.—Plans early call for bids for main units for new municipal steam-electric power plant, including a 20,000-kw. steam turbo-generator unit and auxiliaries, and two watertube boilers with accessory equipment. This equipment is estimated to cost from $700,000 to $750,000 of total estimated cost of $1,800,000 for station. Financing will be arranged in part through federal aid. Peter Diederich is plant superintendent.

NITRO, W. VA.—American Viscose Corporation, 200 Madison Avenue, New York, N. Y., plans installation of motors and controls, regulators, transformers and accessories, conveyors and other equipment in new addition to rayon mill at Nitro, to double present capacity. Cost reported close to $1,000,000. Proposed to begin work soon. W. A. B. Vivian is manager at mill.

CHARLEVOIX, MICH.—Plans extensions and improvements in municipal electrical distributing system. Fund of $125,900 has been secured through federal aid and work is scheduled to begin soon.

KEARNEY, NEB.—Buffalo County Public Power District, Andrews Building, Kearney, A. G. Zimmerman, president, plans extensions in transmission line from Gibson to Shelton, Neb., with number of new distributing lines in area between these two places, including power substation and service facilities. Cost estimated close to $200,000. Financing is being arranged through federal aid. C. Robert Fulton, 2327 South Nineteenth Street, Lincoln, Neb., is consulting engineer.

NEWBERRY, S. C.—Lyles-Ford Tri-County Authority, Newberry, now being organized, care of James W. Johnson, chairman of committee in charge, has preliminary plans under way for hydro-electric power development on the Enoree and Tiger Rivers, comprising three power dams near Blairs, Whitmire and Union, respectively, with hydro-electric generating plant at each dam, power substations and switching stations. Project will include about 200 miles of transmission lines, including system to tie in the three stations and lines to other points in districts noted, where substations will be located for distribution line service. Fund of $14,000,000 is being arranged through federal aid for entire development. Daniel T. Duncan, Ninety-Six (Greenwood County), S. C., is consulting engineer and will begin surveys at early date.

SMITHVILLE, TEX.—Has plans under way for new municipal electrical distributing system. Cost estimated close to $90,000, with power substation facilities. Financing is being arranged through federal aid. Garrett Engineering Company, 308 Hughes Street, Houston, Tex., is consulting engineer.

NEWBERRY, MICH.—State Department of Public Buildings, Lansing, Mich., has plans nearing completion for new steam-electric generating plant for institution at Newberry, and will proceed with work at early date. Cost estimated close to $350,000. Derrick Hubert, 1065 Sheridan Road, Menominee, Mich., is architect; E. R. Little Company, Inc., Ford Building, Detroit, Mich., is consulting engineer.

HASTINGS, NEB.—Central Nebraska Power and Irrigation District, Hastings, George E. Johnson, chief engineer and general manager, receives bids until September 9 for transmission line for Jeffrey Canyon hydro-electric power plant; also for construction of building for Jeffrey Canyon plant, and power substation structures (Group 22-D). At same time, for radial gates and hoists, and other equipment for Parshall flume at Station 252 (Group 22-E); and for head gates, with frames and motors, etc., (Group 22-F).

CLARKSVILLE, TENN.—Will take bids at early date for new power substation at Vine and Reynolds Streets, for switching service, connecting with transmission line of TVA, which will furnish power supply for municipality. Also for new distribution power substation at Eleventh and Coulter Streets, with transformers and auxiliary equipment. James N. Goodrich is engineer for city.

SWANTON, OHIO—Plans new municipal electrical distribution system, with power substation facilities. Cost close to $85,000. Financing is being arranged through federal aid. Ayres, Lewis, Norris & May, Ann Arbor, Mich., are consulting engineers on this project.

VERMILLION, S. D.—Board of directors, University of South Dakota, Vermillion, plans new power house at institution. Cost estimated close to $150,000. Financing will be arranged through federal aid. W. W. Davidson, University offices, is engineer.

New REA Allotments Include Power Units

REA has announced 36 allotments for line construction and wiring loans in nineteen states totaling $6,757,300. The new power lines which this money will build will make electric service available for the first time to some 23,000 farm families and other rural customers. These allotments bring REA's total allotments to more than $109,000,000, of which $19,801,500 represents allotments from the $140,000,000 made available by Congress for REA loans during this 1938-39 fiscal year.

In addition to the allotments, Administrator Carmody set aside $500,000 for the construction of a generating plant or generating plants to serve projects in Ohio which are unable to negotiate satisfactory contracts for the purchase of electric energy at wholesale. One of the new allotments is to a co-operative in Vermont, the first REA allotment in that state.

Among the allotments are the following:

GEORGIA—$163,000 to build approximately 157 miles of line, 746 customers in Dodge, Blackley, and Pulaski counties. Jackson Electric Membership Corporation, $157,000 to build 163 miles of line, 888 customers in Banks, Clark, Jackson and Madison counties.

ILLINOIS—Wayne-White Counties Electric Co-operative, $222,000 to build 206 miles of line, 761 customers in Wayne, White, Hamilton, and Jefferson counties. Coles-Moultrie Electric Co-operative, $355,000 to build 333 miles of line, 995 customers in Coles and Moultrie counties. Edgar Electric Co-operative Association, $280,000 to build 277 miles of line, 808 customers in Edgar County. Adams Electric Co-operative, $400,000 to build 384 miles of line, 1,068 customers in Adams County.

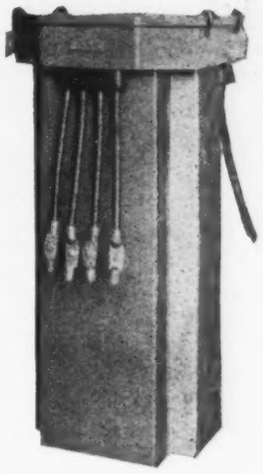
INDIANA—Jay County REMC, $189,000 to build 165 miles of line, 684 customers in Jay County.

IOWA—Calhoun County Electric Co-operative Association, $220,000 to build 195 miles of line, 488 customers in Calhoun, Pocahontas, Sac, and Webster counties.

KENTUCKY—Owen County Rural Electric Co-operative Corporation, $218,000 to build 183 miles of line, 822 customers in Gallatin, Grant, Owen, and Pendleton counties. Fleming-Mason Rural Electric Co-operative Corporation, $220,000 to build 194 miles of line, 819 customers in Bath, Fleming, and Mason counties.

MICHIGAN—Tri-County Electric Co-operative, $1,070,000 to build 1,000 miles of line, 4,000 customers in Mecosta, Montcalm, Gratoit, Isabella, and Shiawasse counties. O and A Electric Co-operative, $1,000,000 to build 1,000 miles of line, 4,000 customers in Allegan, Ottawa, Barry, Muskegon, Newaygo, Montcalm, Mecosta and Kent counties.

MINNESOTA—P.I.C.K. Co-operative Electric Association, $272,000, to build 259 miles of line, 799 customers in Kanabec, Isanti, Mille Lacs, Benton, Chisago, Pine and Sherburne counties. Renville-Sibley Co-



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5. All units are of similar electrical and mechanical design in sizes from 1½ to 100 Kva. and for potentials up to 800 Volts.
6. Coils of fully balanced design and with ample ventilating ducts are vacuum impregnated in varnish.
7. Rigid core construction prevents damage due to momentary short circuit or rough handling.
8. All units are shipped filled with oil so as to reduce your transportation and installation expense.
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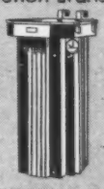
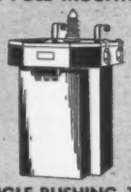
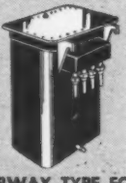


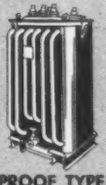
CONVENTIONAL TYPE FOR POLE MOUNTING



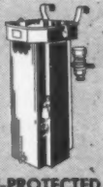
SINGLE-BUSHING TYPE FOR RURAL SERVICE



SUBWAY TYPE FOR SUBMERSIBLE SERVICE



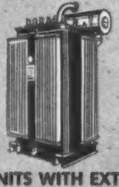
FIREPROOF TYPE FOR INDOOR INSTALLATION



SURGE-PROTECTED TYPE WITH LIGHTNING ARRESTERS

VAULT TYPE WITH JUNCTION BOXES

CONVENTIONAL TYPE FOR OUTDOOR MOUNTING



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operative Power Association, $200,000 to build 174 miles of line, 428 customers in Renville, Sibley, and Kandiyoki counties.

OHIO—Pioneer Rural Electric Co-operative, $104,000 to build 81 miles of line, 435 customers in Miami, Shelby, and Champaign counties. Belmont Electric Co-operative, $166,000 to build 162 miles of line, 629 customers in Belmont, Harrison, Jefferson and Monroe counties.

VERMONT—Vermont Electric Co-operative, $66,000 to build approximately 53 miles of line, 262 customers in Orleans and LaMoille counties.

VIRGINIA—Shenandoah Valley Electric Co-operative, $273,000 to build 236 miles of line, 840 customers in Shenandoah and Augusta counties. B.A.R.C. Electric Co-operative, $161,000 to build 134 miles of line, 552 customers in Alleghany, Rockbridge, and Bath counties.

WISCONSIN—Buffalo Electric Co-operative, $148,000 to build 148 miles of line, 398 customers in Buffalo, Pepin, and Trempealeau counties. Trempealeau Electric Co-operative, $204,000 to build 175 miles of line, 519 customers in Trempealeau, La-Crosse, Eau Claire, and Jackson counties.

NORTH DAKOTA—Tri-County Electric Co-operative, $30,000 for construction of a generating plant to supply power to 81 miles of line, 502 customers.

Construction contracts include:

FLORIDA—Clay Electric Co-operative Association, to R. H. Bouligny, Inc., Charlotte, N. C., for building entire project, 137 miles of line to serve 445 customers, $73,820.

MONTANA—Flathead Power & Light Association, to Cahill Mooney Construction Company, Butte, for building entire project, 123 miles of line to serve 272 customers, $98,699.

NORTH DAKOTA—Baker Electric Co-operative, to purchase materials from Graybar Electric Company, Phelps Dodge Company, J. E. Sumpter and General Electric Company, for construction of 13-mile addition to project.

OHIO—Western Farm Bureau Electric Co-operative, to Davis-Hydaker Company, Spencerville, for constructing second section of project, 118 miles of line to serve 413 customers, $95,969. Firelands Electric Co-operative, to Bigley Electric Company, Findlay, for building first section of project, 101 miles of line to serve 275 customers.

WASHINGTON—Quinalt Light Company, to NePage McKenney Company, Seattle, for building distribution lines for project, 24 miles, $26,283.

●

Relief From Hay Fever

Publication of a new booklet of special interest to sufferers of hay fever and pollen asthma has been announced by the Delco-Frigidaire conditioning division of General Motors Sales Corporation. The new publication outlines the results of a series of tests in which air-conditioning equipment was used to retard and relieve suffering from these seasonal afflictions. This booklet, entitled "Relief of Hay Fever and Kindred Maladies by Means of Air Conditioning," may be obtained free of charge.

New Issues Listed with Commission

Commonwealth Edison Company has filed a registration statement with the SEC covering $33,000,000 of 3½ per cent first mortgage bonds, series I, due 1968, and between $39,251,600 and $50,208,745 of 3½ per cent convertible debentures, due 1958. The company also registered between 7,850,320 and 10,041,749 subscription warrants evidencing rights to subscribe for the debentures and between 1,570,064 and 2,088,350 shares common stock, $25 par value, to be reserved for conversion of the debentures. The amount of convertible debentures, warrants and common stock will depend upon the extent to which certain exchange offers are accepted.

Six subsidiaries of North Boston Lighting Properties have filed declarations under the Holding Company Act, covering the issuance of 3 per cent notes, evidencing loans by the parent company, SEC has announced. The subsidiaries and the amount of notes to be issued are: Beverly Gas & Electric, $650,000; Gloucester Electric, $235,000; Haverhill Electric, $1,014,375; Malden Electric, $200,000; Salem Gas Light, $425,000 and Suburban Gas & Electric, $785,000.

Other applications recently filed with the commission follow:

United Illuminating Trust of Connecticut for an order exempting it and its subsidiaries, the United Illuminating Company and the Illuminating Shares Company, from the provisions of the Holding Company Act.

SEC has declared effective a declaration filed by Massachusetts Utilities Associates covering the issuance of an unsecured note for $4,000,000.

The following companies have filed statements on Form U5B, the complete form for registration under the Holding Company Act: Electric Bond & Share, National Power & Light, Electric Power & Light, American Power & Light, Pacific Power & Light, Lehigh Power Securities, Louisville Gas & Electric, American Gas & Electric, Consolidated Electric & Gas, Central Public Utility Corporation, North Continent Utilities, East Tennessee Light & Power, Toledo Light & Power, Cities Service Power & Light.

Gulf States Utilities Company has filed a declaration covering $10,000,000 of first mortgage and refunding bonds, series D, 4 per cent.

SEC has set a hearing for August 29 on the declaration of the Cincinnati Gas & Electric Company relative to the reduction of its common capital from $30,000,000 to $7,500,000.

Copper District Power Company has filed covering issuance of $78,750 of unsecured 4½ per cent notes to be issued in exchange for and to refund an equal amount of outstanding unsecured 4½ per cent notes. One-half of notes are to be held by Middle West Corporation, parent company, and other half by Copper Range Company.

South Carolina Utilities Company has

secured exemption from the utility act of the issue and sale of its 5 per cent, $150,000 secured promissory note, maturing May 1, 1942. Proceeds are to be used to cover capital expenditures made or to be made.

Declaration by the West Penn Power Company, a subsidiary of the American Water Works & Electric Company, covering the issue and sale of $17,000,000 of 3½ per cent first mortgage bonds, Series J, due August 1, 1968, has been permitted to become effective by an order issued by the SEC. The commission reserved opinion, however, on the reasonableness of fees of $63,750 to be paid to W. C. Langley & Company for services in negotiating the sale.

•

Shawinigan Shareholders Approve Cut in Capital

Reduction of the paid-up capital by $4,555,450 through elimination of the amortized bond premium, discount and expense in one operation, has been agreed to by shareholders of the Shawinigan Water & Power Company. Ordinarily this item would be liquidated through annual appropriations from earnings. It is not represented by any tangible assets and in writing it off, the paid-up capital is reduced to $67,562,996.

"This operation does not in any way involve a change in the number of outstanding shares or the equity behind the capital stock. Further, earnings available on the common are improved as a result of the shareholders' action as no longer will it be necessary to amortize the discount, etc., against earnings. Last year the appropriation on this account totaled $159,158.

•

New Rural Loan Approved

The Virginia Corporation Commission has approved the Craig-Botetourt Electric Co-operative's plan to obtain $70,000 more from the REA to carry on its work in four Virginia counties and Monroe County, W. Va. The order approving issuance to the REA of a note or notes not exceeding $70,000 stated that there be no interference with operations of the Painter Bank Telephone Company. The co-operative has 55 miles of line in Craig, Botetourt, Giles and Alleghany counties and 28 miles in Monroe.

•

Time Extension for Project

Federal Power Commission has granted an extension of time until September 1 for completion of construction on the project works of the 63,000-hp. hydro and irrigation project of the Loup River Public Power and irrigation District, Columbus, Neb., originally scheduled for completion July 1.

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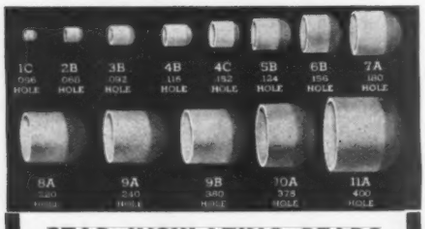

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[*Continued from page 34*]

feeders, it is thus possible to increase the carrying capacity of the transmission system and substations at an expenditure of about $10 per kilowatt, as against an original investment of about $90 to $100 per kilowatt. This cannot be carried on indefinitely, but additional carrying capacity can be gained by installing capacitors up to the point where the power factor nears unity. Additional voltage increases may be obtained by installing sufficient capacitors to change the power factor to leading, but this will be at the expense of some additional power loss due to excess of leading current on the system.

Our company has made a considerable number of static capacitor installations on various distribution systems. Curves accompanying this article show results obtained by installation of 1,020 kva. of capacitors on four feeders of one of our distribution systems. In general, the voltage regulation has been improved about 5 per cent on each of the feeders. The power factor has been raised from 68 per cent to 85 per cent on two of the feeders and from 78 per cent to unity on the other two feeders. These particular feeders are at present equipped with feeder regulators compensated for line drop, and it was interesting to note the reduced voltage at the source of the feeders when the capacitors were placed in service.

Judicious operation of loop

As an example of obtaining greater value from the dollar invested in transmission, reference is made to the condition shown on the accompanying map of a portion of the Interstate Power system.

The loop from the Dubuque plant to Prairie du Chien might be operated in three different ways, with large differences between the resultant maximum carrying capacities of the loop imposed by the requirement of maintaining a minimum of 33 kv. at Prairie du Chien. One method would be to hold 35,100 volts constant at Dubuque. The second would be to vary the Dubuque pressure from 34,000 volts during light load periods to 36,600 on the peak. The third would be to vary the Dubuque voltage up to 36,660 volts on peak and to operate a 1,500-kva. synchronous condenser at Prairie du Chien. The carrying capacities of the loop under these three conditions are shown in the accompanying table.

It is plain from these figures that the comparatively small investment in the synchronous condenser has greatly raised the value of investment in the transmission lines. The power lost has of course been somewhat increased, but the cost assignable to this factor does not subtract significantly from the advantage realized. By operating on the third method, as appears from the accompanying curves of coincident voltages at the Dubuque power plant and at three load points, the condition of varying voltage has been shifted from the places where it would bother customers to the power plant where it belongs.

•

Utility Securities Added to Legal List

The following electric light and power bonds have recently been added to the list of legal investments for savings banks in the State of New York:

Bangor Hydro Electric, 1st 3½s, 1963.....$600,000
Central Hudson Gas & Electric, 1st and ref. 3½s, 1967.....2,500,000
Central New York Power, gen. 3¾s, 1962.....48,364,000
Consumers Power, 1st 3½s, 1967.....9,000,000
Fall River Electric Light, 1st 3⅜s, 1968, series A....2,000,000
Northern New York Utilities, 1st lien and ref. 7s, 1946, series A.....1,160,000
1st lien and ref. 6s, 1947, series B.....1,293,000
Ohio Public Service, 1st 4s, 1962.....28,900,000
Rochester Gas & Electric, Gen. 3¾s, 1967, series H..3,000,000
Utica Electric Light & Power, 1st 5s, 1950.....1,000,000
Utica Gas & Electric, Ref. and ext. 5s, 1957.....4,610,000

•

FPC Dismisses Rate Case Involving Oklahoma Gas

The Federal Power Commission has accepted the revised rate schedule FPC No. 4, recently filed by the Oklahoma Gas & Electric Company following FPC objections to the original schedule, and the proceedings instituted against the utility on February 2 and April 14 have been dropped.

The suspended schedule was filed by the utility under a new agreement with the Public Service Company of Oklahoma and the Southwestern Light & Power Company covering the sale and interchange of firm, excess, dump and emergency electric energy. FPC contended the new agreement was ambiguous.

New Cable Fault Locater Fast, Convenient, Accurate

[*Continued from page 41*]

a three-conductor, 12-kv. paper-insulated, lead-covered cable in duct 3,273 ft. long. Simulated faults. (1st) Fault 21 ohms—115 volts d.c. used in test—accuracy 7 ft. (2d) Water fault of about 150,000 ohms—1,000 volts d.c. used in test—accuracy 3 ft. (3d) "Air gap" fault of immeasurable resistance—24,000 volts d.c. used in test—accuracy exact, with a fluctuating measuring voltage.

3. Actual case of trouble on a 4-kv. feeder in Chicago having thirteen taps —total length about 6 miles—11,000 volts d.c. used in test—accuracy about 120 ft. This case is remarkable because the condition of the fault was such that the supply voltage was intermittently arcing at the fault and the current could not be stabilized. Transients were sufficient to burn out one of the shunts and the galvanometer. The location was finally made with a new galvanometer and the shunt has since been redesigned.

4. Actual case of trouble on an overhead telephone cable about 2 miles long. All conductors grounded —115 volts d.c. used in test with a special Fisher connection. Entirely different telephone wires used as return circuit. Accuracy about 30 ft.

5. Actual case of trouble in Lake Forest, Ill., on a two-conductor No. 6 customer-owned steel-taped cable about 600 ft. long and buried directly in the ground. Only one conductor continuous and grounded. Overhead wire laid on top of ground for return —115 volts d.c. used in test. Accuracy 6 ft.

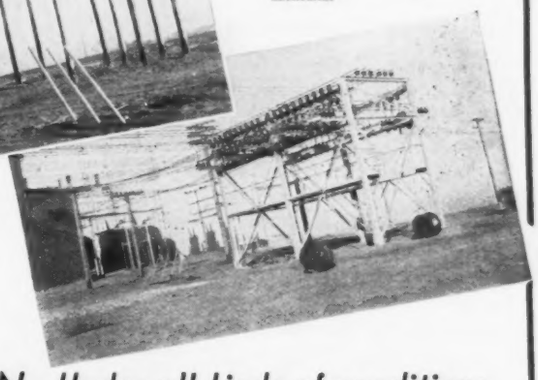
6. Actual case of trouble at Libertyville, Ill., on customer's three-conductor, No. 2, rubber-covered, wire-wound submarine cable partly submerged in a lake and partly on floats; 870 ft. long—1,000 volts d.c. used in test. Accuracy 2 ft. 8 in.

Eight-hour saving

Three complete sets are now in regular use in both companies, superseding much of the equipment formerly used for this purpose. The results were better than expected and a considerable saving in time and labor has resulted on the majority of faults. This saving may be as much as eight to ten hours in some of the high-voltage cases where a long process of breakdown was formerly necessary.

• *Wood Pole Structure for 6600 v distribution system forming a turn of ninety degrees.*

• *Steel Switching Tower erected at Fort Peck, Montana.*



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BOOK REVIEWS

Electrical Engineering

By Clarence V. Christie. Published by McGraw-Hill Book Company, 330 West 42d Street, New York, N. Y. 710 pages, illustrated. Price, $5.

Fifth edition since the first in 1913, this latest edition of Professor Christie's (McGill University) book holds to the conventional mathematical-vectorial approach and content of d.c. and a.c. machinery and conversion apparatus. But there have been such additions as the three-winding transformer, as well as new routes to the understanding of the synchronous and induction machines. A unique feature is the inclusion of detailed quantitative design of a d.c. generator, an alternator, a transformer and an induction motor, each solution lending added force to the ruling expressions developed for each type of equipment. The long transmission line is left largely in the stage of approximation from expansion of the hyperbolics into series. A short chapter on symmetrical components has also been added.

•

Electricity in Yugoslavia, Czechoslovakia and Rumania

Published by Elektrotechnicky svaz Ceskoslovenski, Praha. 273 pages. Price not stated.

In a series of articles liberally illustrated and accompanied by statistics, this attractive book, commemorating the 20th anniversary congress of the Czechoslovakian Electrical Association, records the history of electrical progress in the three countries mentioned. Since most of the text is in the corresponding languages, some linguistic ability is needed to read it. The difficulty is partly met by abstracts in French or German, but some of these are very brief.

•

Effect of City Water and Sewerage Facilities on Industrial Markets

Published by Marketing Research Division, Bureau of Foreign and Domestic Commerce, Washington, D. C. 100 pages. Price, 10 cents.

This study covers cities of 20,000 or more population and was designed to furnish manufacturers and distributors of air-conditioning equipment with an effective indication of the market possibilities of each city and thus enable them to plan their activities more efficiently.

The material presented consists mainly of tables, giving, for each city, (1) detailed figures on available water supplies, storage capacity and population; (2) annual delivery by year, 1931-1936; (3) service per capita; (4) effective air-conditioning installations of water supplies; (5) normal mean temperature and temperature of water at main outlet.

•

Der Schutzbereich von Blitzableitern

(The Range of Immunity Afforded by Lightning Protection)

By Dr.-Ing. Anton Schwaiger. Published by R. Oldenbourg, Munich. 115 pages, 27 illustrations. Price, 5 reichsmarks.

Improved lightning protection for buildings can be designed in the light of laws now known regarding ultra-high-tension phenomena and the same principles apply also to the protection of aerial electric lines, the author contends. He points out that buildings and lines, assumed to be protected, have in fact been struck. In this book he discusses the conditions requisite for complete immunity and shows how this may be obtained for structures of various forms. Conclusions were checked with an exploratory laboratory method for measuring the electrical field. Sparing use is made of mathematics. An interesting historical introduction traces methods advocated by various scientists beginning with Franklin.

•

Steels for the User

By R. T. Rolfe. Published by Chemical Publishing Company of New York, Inc. (exclusive agents for the Americas). 275 pages, illustrated. Price, $8.50.

Designers and users of steel in turbo-alternators and other electrical machinery, especially that subject to high temperatures and high stresses, will find this a highly practical discussion. Likewise is there much of interest for those who are promoting electric steels and the electric heat treatment of all steels. The author takes the approach of the user and throughout presents world-wide data compiled and collated to obviate resort otherwise necessary to a diffuse set of authentic sources. Neither a metallurgist's academic treatise nor a mere handbook of collected data, the book is, however, an interpretative correlation of service requirements with available properties of appropriately selected steels.

Effect of composition, processing and fabrication upon qualities for stressing and further fabrication comprise the first third of the pages. Heat treatment is the subject matter of considerably more than a middle third. Performance of steels at elevated temperatures absorbs all of one of the eleven chapters. Creep is a dominant topic and it is of interest to note that the author sets up permissible hourly creep value of 10^{-9} for turbine rotor wheels shrunk on shafts, and also 10^{-7} for steam piping, welded joints and boiler tubes and 10^{-6} or 10^{-5} for superheater tubes, if adequate clearances are not to be lost after ten years of creep growth.

In connection with each aspect of the behavior of steels there is a concise discussion of the test methods recognized for ascertaining the respective properties. Unusually valuable for the designer and user is a final chapter enumerating the practical principles of selection of steel with the right properties for the job.

•

Direct, Alternating Currents —Theory and Machinery

By E. A. Loew. Published by McGraw-Hill Book Company, 330 West 42d Street, New York, N. Y. 718 pages, illustrated. Price, $4.50.

Recognition has been given in this second edition to advances and shifts in practice emphasis since the first edition (of 1933). Synchronous machines have been given more space and material has been added on capacitor motors, the stroboscope, oscillograph. The chapter on electronic tubes has been substantially expanded. Withal the book remains a nicely balanced treatment of basic principles with enough about apparatus to clinch the fundamentals and orient the student toward the reality of applications. The teacher will find that all the problems are new but no answers are given, an unfortunate omission in a book that could very well be a self-help or a furthering book for the engineer educated a decade or two ago.

•

American Bureau of Metal Statistics Year Book

Published by the American Bureau of Metal Statistics, 33 Rector Street, New York. 120 pages. Price, $2.

In this nineteenth annual issue various series of statistics on non-ferrous metals are carried through 1937. Most of the book is devoted to copious data on copper, lead, zinc, gold and silver, relating to production, consumption, imports, exports, prices, in the United States and on a world-wide basis. The remainder of the book, about one-seventh, deals with miscellaneous other metals—platinum, antimony, nickel, tin, aluminum, cobalt. Inclusion of comparable figures for earlier years obviates the need of referring to previous issues. Large type on an 8x10½-in. page makes reading easy.

Tower Access, Safety in 132-Kva. River Crossing

[*Continued from page 43*]

not less than 20,000 lb. Arcing rings are used on each insulator string t the conductor end.

Although the crossing is located in a medium-loading territory, it is close to the border line and it was considered wise to use heavy loading. Some consideration was given to the possibility of breakage of cables by naval or other planes which would subject the towers to the breaking tension of any cables which might be severed by such means. In consideration of the importance and location of the crossing, cables were sagged to provide a safety factor of two in both cables and towers when the cables are loaded with ½ in. radial ice and 8 lb. per sq.ft. horizontal wind load on the cable.

The above loading produces a tension of about 4,000 lb. in the bare cable at 60 deg. Selecting the cable for this low stringing tension and the convenient arrangement of access platforms provided to the insulator assemblies on the towers facilitated and reduced the cost of assembling the cables in place between the towers, which work was undertaken without experiencing any unusual difficulties.

Towers were constructed of mild steel throughout, and although economy in weight of structure might have resulted from the use of steel having a higher elastic limit, no economy in cost was apparent, and the smaller section which might have been used with the higher strength steel would not have emphasized the outline of the structures to the extent obtained by the section used. Crossarms were completely galvanized and bolted, although complete field painting in addition was necessary to give the color band effect previously referred to. The complete tower mast structure below the crossarms was shop and field riveted.

The entire crossing was designed and built by the Stone & Webster Engineering Corporation, except the fabrication and erection of the main towers, which was done under its supervision. The main tower superstructures were fabricated by the Lehigh Structural Steel Company of Allentown, Pa., which sublet the erection to the Hartenstine & Zane Company of New York.

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Plant Design Modified by New Developments

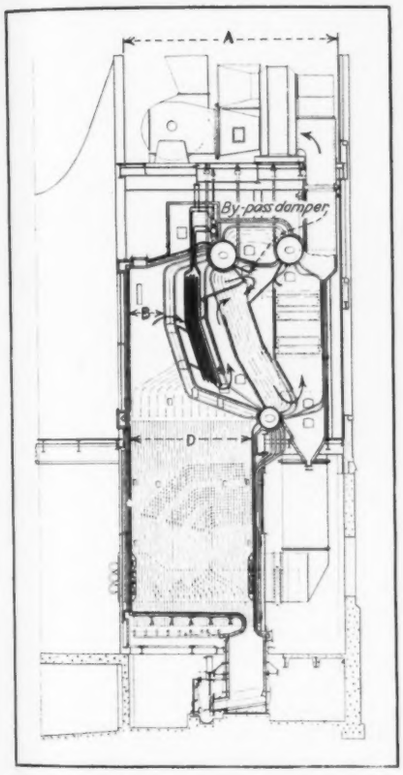
[*Continued from page 32*]

circuit normal voltage will not exceed 50.

A Westinghouse type BJ-30 high-speed exciter rheostatic voltage regulator (using both normal and quick response) is used in conjunction with the pilot exciter for voltage control.

Temperature for both the main and house generators are recorded on a common 12-point Leeds & Northrup temperature recorder. The main generator temperatures are printed in blue ink, points 1 to 7, and the house generator in red ink, points 1 to 5 on a single chart.

The main generator leads between the turbine room and switch building consist



Variable gas flow through superheater

The by-pass damper indicated allows a short cut for part of the flue gases when superheat temperature reaches a certain maximum. This feature allows the operator to maintain constant steam temperature over a considerable range in capacity.

of two single-conductor 1,250,000-circ.mil, paper-insulated, lead-covered cables per phase. Cables are installed on transite shelves on one side of a cable tunnel. The front of the shelves is covered with removable transite sheets, which permits easy access to the cables.

The house service generator leads between the turbine room and the house switch room consists of four single-conductor 2,000,000-circ.mil, varnish cambric, braid-covered cables per phase. These leads are connected to the house service bus through a three-pole, 4,000-amp. air circuit breaker. Transite conduit was used for these leads because it was non-magnetic and had ample strength to be supported in the open by pipe hangers.

An unusual feature of the main generator control is an automatic interlock to prevent damage to the machine if it should accidentally be connected to the bus out of synchronism.

There are no short cuts in the making of-

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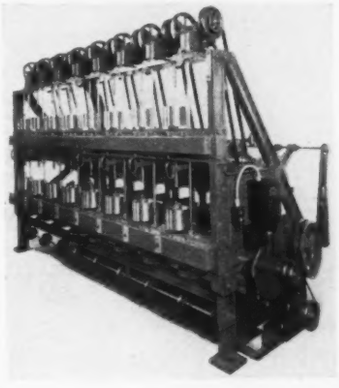

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PWA PROJECT DOCKET NO.
TENN.-1105-P-DS
ELECTRIC DISTRIBUTION SYSTEM
SUB-PROJECT—CONTRACT NO. 4
ELECTRIC POWER BOARD
OF CHATTANOOGA
CHATTANOOGA, TENNESSEE

Sealed proposals for the construction of Sub-Project—Contract No. 4 of the Electric Power Board of Chattanooga, acting for and on behalf of the City of Chattanooga, Chattanooga, Tennessee.

PWA Project Docket No. Tenn.-1105-P-DS
Electric Distribution System

SUB-PROJECT—CONTRACT No. 4 will be received by the Electric Power Board of Chattanooga, Chattanooga, Tennessee, at the office of the Secretary of the Electric Power Board of Chattanooga, Municipal Building, Chattanooga, Tennessee, until 1:00 P.M. on the 30th day of August, 1938, and will be immediately publicly opened and read by the Electric Power Board of Chattanooga.

Copies of the Proposal, Contract Documents, Plans and Specifications may be obtained from the office of the Electric Power Board of Chattanooga, Municipal Building, Chattanooga, Tennessee. A deposit (certified check) of One Hundred ($100.00) dollars will be required for procuring the Proposal, Contract Documents, Plans and Specifications. The deposit for these documents will be returned to all except the successful bidder upon the return of the documents in good condition within ten (10) days after the bids are opened.

A copy of the Proposal, Contract Documents, Plans and Specifications may be examined free of charge at the Chamber of Commerce and the office of the Electric Power Board of Chattanooga, Chattanooga, Tennessee.

Each bid must be accompanied by a Certified Check, or Bidder's Bond executed by the bidder and a surety company licensed to do business in Tennessee, in the sum of ten (10%) per cent of the amount of the bid. The bond is required as a guarantee that if the bid is accepted, a contract will be immediately entered into and the performance of it properly secured. The successful bidder will be required to execute a Performance Bond in the amount of one hundred (100%) per cent of the contract price. This Performance Bond shall be made through a Company having a duly authorized representative in Chattanooga, Tennessee, upon whom process may be served.

All items in the proposal form must be properly filled out and must not be detached from the specifications. No qualifying letters or statements will be considered.

All bidders must be licensed contractors as required by Chapter 70 of the Public Acts of 1931 of the General Assembly of the State of Tennessee, Section 1. Bidder's name and license number must be placed on the envelope containing these documents, and also upon this envelope shall be designated the name and contract number which the bid covers.

WAGES: Attention is called to the fact that no less than the minimum wage rates as set up in the Specifications shall be paid on this project.

WITHDRAWAL OF BIDS: Bidders may withdraw bids at any time prior to the opening, but thereafter no bidder may withdraw a bid submitted for a period of sixty days after the date set for the opening of such bids.

The estimated cost of the construction of the project covered by this contract is $370,000.

The Electric Power Board of Chattanooga, Chattanooga, Tennessee, reserves the right to reject any and all bids, and to waive informalities therein.

Any bid received after the scheduled closing time for receipt of bids will be returned to the bidder unopened.

This contract will not be awarded nor a contract executed with the successful bidder until funds for its completion are deposited in the bank.

ELECTRIC POWER BOARD OF
CHATTANOOGA,
Chattanooga, Tennessee

By L. J. WILHOITE, Acting Chairman
L. J. WILHOITE
G. H. PATTEN
J. C. TWINAM
STANTON E. SMITH

Will F. Chamlee, Counsel.
Attest:
N. J. Simmons, Secretary.

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